THE IRON TRADE REVIEW

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THE WEEK IN IRON CIRCLES.

THE MARKET AT LARGE.

Scarcity of coke has more strongly asserted itself in the past week as a factor in the situation, and at the same time and no doubt partly in consequence of the fuel stringency, consumers of pig iron continue to buy freely for the first half of next year. The activity is still very largely in foundry iron and prices for the first half of next year are being dragged upward, in spite of the high level already reached and without regard to the experience of 1899, so dearly paid for in 1900. Conditions and not theories are determining prices, and statistics and weekly market developments run to the same purport—that production of pig iron is no match for consumption and not likely to be for some months. Evidences of curtailed buying in view of high prices are still looked for in vain. Steel Castings' manufacturers note that there has not been quite the same volume of orders for heavy castings recently as for the past six months, and the relaxed condition of the tin plate, sheet and wire industries is reflected in the lighter expenditures for repairs and replacements in mills in these lines, but these are minor considerations with consumption so broad and diversified. The August pig iron statistics, showing stocks of about 75,000 tons at merchant furnaces, with a reduction of 6,000 tons in July, and an active furnace capacity of 336,465 tons a week, based on the actual production in July, emphasized the dominance of the fuel factor. Production is now at practically the rate of February, or about 17,450,000 tons a year, while on July 1 it was at a yearly rate of 18,250,000 tons. The scarcity of coke is again curtailing production at the Valley furnaces, ten being inoperative at one time early this week. Unless the shipments are greatly increased before the end of the week additional furnaces will be forced to bank their fires. In the West, a Milwaukee and a St. Louis furnace have been banked and Chicago district furnaces are nearly as badly off for coke as in January. Two Kentucky furnces and one in Tennessee that were banked for ten days, have started again. The fact that certain Southern sellers of pig iron have ceased for the time being to sell iron for the first half of 1903, has brought business to others at advanced prices, and late sales are for the most part at $18, with $17.50 as the general minimum for No. 2. Northern irons are also higher, and $22 at furnace for No. 2, 1903 delivery, is commonly asked. Pittsburg reports the sale of a considerable tonnage of steel making pig iron for delivery during the second quarter of next year at $21 at the furnace. The market for steel continues to be largely an import market, and the decline in foreign steel is from 50 cents to $1 in the past month. A sale of 10,000 tons of foreign billets is reported through Chicago for delivery at a mill farther east. The Chicago price is now close to $31. A firmer market for bar iron is practically the only feature in finished material, in addition to active buying of track supplies. Chicago reports a good tonnage pending in bar iron and 1.95c is now well maintained. A large tonnage of Middlesborough foundry iron is being offered at Pittsburg, for early delivery at prices ranging for $21.50 to $21.75 per ton delivered. The only objection to the iron is its high percentage of phosphorus, although the silicon ranges from 2.75 to 3 percent. The rail tonnage for delivery next year was further increased by an order for 24,000 tons placed by the Norfolk & Western railroad. Two important iron and steel developments in the week, apart from the market, are the strong efforts to have the Amalgamated Association's adverse decision on the wage reduction reconsidered, and the formation of the harvesting machinery combine, which will have its own steel plant and rolling mills. The vote on the tin plate wage reduction is considered irrevocable. Tin plate stocks and wire stocks show considerable accumulation.

PITTSBURG.

OFFICE OF *The Iron Trade Review*,
429 PARK BUILDING, August 20.

The congested condition of all the railroads in this district has again seriously interfered with the proper delivery of coke to the furnaces in the Mahoning and Shenango Valleys, and for several days this week no less than ten furnaces were compelled to bank on account of the non-delivery of coke. At present nearly all of these furnaces are still inoperative and there is little probability that operations can again be resumed in full before the end of the week. A number of the Valley furnaces failed to receive any coke during the past three days of last week, and any stocks they had on hand soon became exhausted. All the available cars are now being pressed into the lake coal traffic, and in addition to the inability of the railroads to ship material from the coke regions, they are not supplying the coke manufacturers with more than 75 percent of their regular car supply. With a continuation of such unfavorable conditions for the production of pig iron, the merchant furnaces will be unable to catch up on their deliveries, and large tonnages of metal that should have been delivered this year will undoubtedly be carried over into 1903.

While no price has yet been fixed for Bessemer iron for delivery the second quarter of next year by the merchant furnaces in the Valleys, a sale of a considerable tonnage has been reported at $21 at the furnace. This price is much higher than has been anticipated not only by consumers but by the furnacemen as well. The last sale of 30,000 tons of Bessemer for delivery through 1903 was made on a basis of $18 at the furnace, a price that was considered extremely conservative at the time. The United States Steel Corporation still continues to withhold negotiations on its requirements of Bessemer for the second quarter of next year, but from present indications the price that will be paid will be much higher than that paid for the iron for delivery through the last quarter of this year and extending through the first quarter of 1903.

No less than 10,000 tons of No. 3 Middlesborough foundry iron are being offered in this market by various importing houses, at prices ranging from $21.50 to $21.75, delivered within the next two months. The iron is extremely desirable owing to its high percentage of silicon, but owing to its high phosphorous, the foundrymen prefer to pay the higher prices asked for prompt domestic irons. Sales of about 6,000 tons of the harder Southern foundry irons have been made during the past week on a basis of $17 to $17.25, Birmingham. These prices were paid despite the fact that all contracts have been closed f. o. b. furnace, the consumer taking the risk of higher freight rates that will no doubt prevail after the first of next year. The present rate to Pittsburg is $4.15 per ton from furnaces in the Birmingham district but the railroad interests have considered making an advance of 50 cents per ton. Before the present rate was established the higher rate of $4.65 prevailed, but this was reduced to $4.15 at the solicitation of the furnacemen in the South about two years ago to enable them to compete more advantageously with the Northern furnaces.

The Norfolk & Western Railroad has placed its contract for rails for delivery next year amounting to 24,000 tons, the Pennsylvania Steel Co. receiving the bulk of the order.

In finished lines the market continues quiet, although agreement prices are being well maintained. The tin plate trade is in an extremely quiet condition for this season of the year, and many of the mills of the American Tin Plate Co. are closed at present and will remain closed until the present stocks are disposed of. A number of the lodges of the Amalgamated Association have again reconsidered their vote on the 25 percent reduction on rebate plate and in several instances there has been a reversal of feeling. It is extremely doubtful whether the proposition will carry however for the reason that many of the tin workers not employed in the mills of the American Tin Plate Co. are opposed to the proposition. A number of the smaller mills of the American Sheet Steel Co. in Ohio are also closed at the present time on account of the lull in the trade, but as there are indications of a large demand for black sheets during the next three months, operations will soon be resumed at these mills.

PIG IRON.—The tendency of prices on both Bessemer and foundry irons continues upward. Sales of carload lots of No. 2 Foundry have been made in this market at $24.50 to $25 per ton during the past few days, and as spot Northern foundry iron is extremely scarce still higher prices will no doubt rule before many weeks have elapsed. A new price has also been established on Bessemer iron for delivery the second quarter of next year by the sale of a large tonnage at $21 at the furnace. While Southern furnaces no longer have any No. 2 Foundry to offer for delivery the first half of next year, we note sale of Nos. 3 and 4 during the past few days amounting to 6,000 tons at prices ranging from $17 to $17.25, Birmingham. The banking of the furnaces in the Mahoning and Shenango Valleys will again curtail the production, which has been hampered this entire summer, and all conditions are favorable towards the maintenance of the present high prices for some time to come. We revise quotations as follows:

Bessemer, Valley	$21 00 to 21 75
Bessemer, Pittsburg	21 75 to 22 50
No. 1 Foundry	24 50 to 25 00
No. 2 Foundry	23 00 to 24 00
No. 3 Foundry	21 75 to 22 25
Gray Forge, Pittsburg	21 75 to 22 00
Chilled Basic, Valley	20 75 to 21 00
Chilled Basic, Pittsburg	21 50 to 21 75

STEEL.—German billets are now being freely offered at $30, Pittsburg, and lower prices are expected. Consumers are not placing their orders at the present time preferring to await the lower prices which will no doubt prevail in the German market shortly. Domestic Bessemer billets are being offered at $32 per ton and an order for a large tonnage could no doubt be placed at $31.50 to $31.75, delivered, Pittsburg. Open-hearth billets are held at $33.25 to $33.50. Bessemer rods for early shipment are held at $36.50 to $37 per ton.

FERRO-MANGANESE.—The market is extremely quiet there being practically no demand for either German or domestic. German ferro, 80 percent, is now quoted at $51.50, delivered, Pittsburg, while the English product is held at the same price at which the domestic is nominally quoted, $52.50 per ton, delivered at buyer's mill.

MUCK BAR.—No sales of muck iron have been reported and we quote neutral muck bar at $35.50 to $36 per ton.

SKELP.—The market continues quiet, although offerings of iron skelp continue to be made in this market by mills in Eastern Pennsylvania. Steel skelp, both grooved and sheared is held at 2.25c while iron is quoted at 2.10c to 2.15c.

SPELTER.—The spelter market has remained practically stationary during the past week and prime Western grades are quoted at 5.33½c to 5.35c, Pittsburg.

RAILS AND TRACK MATERIAL.—The Norfolk & Western Railroad placed an order for 24,000 tons of rails for delivery next year with the United States Steel Corporation and the Pennsylvania Steel Co. during the week. The Pennsylvania Steel Co. received 14,000 tons of the order and the mills of the United States Steel Corporation will roll the remainder of the tonnage. We make the following quotations: Standard sections, 50 pounds and over, in lots of 200 tons and over, $28; car lots and less than 200 tons, $30; less than car lots, $32; light rails, 8 pounds, $46; 12 pounds, $44; 16 pounds, $42; 20 pounds, $40; 25 to 40 pounds, $38 to $40. Track material: Spikes, 2c to 2.05c; track bolts, square heads, 2.50c; hexagon heads, 2.65c; fish plates, 1.60c.

BARS.—The current business in both iron and steel bars is limited to small lots entirely. The iron bar market however is extremely strong as the mills rolling this material all report a large tonnage closed for future delivery. We make the following quotations: Bessemer steel bars, 1.60c; open-hearth, 1.70c; plow beams and cultivator beams, 1.60c, net; channels, angles, zees and tees, Bessemer under 3 inches, 1.70c; over 3 inches, 1.80c; bar iron, 1.80c to 1.90c, Pittsburg, with full freight added to point of delivery. Hoops and bands are quoted at 1.90c, full extras, in 250-ton lots and over, and 2c in less than 250-ton lots; refined iron bars, 2.25c and upwards.

PLATES.—Plates for delivery during the months of November and December are held at 1.85c, Pittsburg. Several of the mills in this district have small tonnages to offer for this delivery but only at premiums of $5 per ton. Agreement quotations are as follows: Tank plates, ¼-inch thick and up to 100 inches in width, 1.60c at mill, Pittsburg; flange and boiler steel, 1.70c; marine, ordinary firebox, A. B. M. A. specifications, 1.80c; still bottom steel, 1.80c; locomotive firebox, not less than 2.10c, and it ranges in price to 3c. Plate more than 100 inches wide, 5c extra 100 pounds. Plate 3-16 of an inch in thickness, $2 extra; gauges Nos. 7 and 8, $3 extra. These quotations are based on carload lots, with 5 cents extra a hundred pounds for less than carload lots. Terms, net cash, in 30 days.

PIPES AND TUBES.—A fair demand continues and both the mills of the National Tube Co. and the independent producers are operating in full. Prices are being firmly maintained. Quotations to jobbers in carload lots, with freight added to destination, are as follows:

MERCHANT PIPE.

	Black Percent.	Galv. Percent.
⅛ to ½ and 11 to 12 inches	60	48
¾ to 12 inches	67	55

BOILER TUBES.

Steel.

	Percent.
1 to 1½ inches	45
2¼ to 5 inches	62½
1¾ to 2¼ and 6 to 13 inches	52½

Iron.

	Percent.
1 to 1½ inches	42½
2¼ to 5 inches	50
1¾ to 2¼ and 6 to 13 inches	40

CASING.

	S. and S. Percent.
2 to 3 inches	58
3¼ to 4 inches	60
4¼ to 12½ inches	63

SHEETS.—A number of the mills of the American Sheet Steel Co. in Ohio are closed at present owing to a falling off in the demand for the lighter gauges. It is probable that they will resume operations in September however. We make the following quotations on black sheets in small lots from jobbers: Nos. 10 and 12, 2.40c to 2.50c; 14 and 15, 2.50c to 2.60c; 16, 2.60c; 18 and 20, 2.70c to 2.80c; 22 and 24, 2.80c to 2.90c; 26, 2.90c to 3c; 27, 3c to 3.10c; 28, 3.10c to 3.20c; 29, 3.25c to 3.35c; 30, 3.35c to 3.45c. Galvanized sheets, in carload lots to consumers, are quoted at 3.05c for Nos. 10 and 11, 3.45c for Nos. 18 to 21, 4.20c for No. 27, and 4.50c for No. 28. Galvanized sheets, mill shipments in carload lots to consumers are as follows: Nos. 10 and 11, 3.05c; Nos. 12 to 14, 3.15c; Nos. 15 to 17, 3.25c; Nos. 18 to 21, 3.45c; Nos. 22 to 24, 3.75c; Nos. 25 and 26, 4c; No. 27, 4.25c; No. 28, 4.50c.

WIRE AND WIRE NAILS.—There has been no change in market conditions although a brisk demand will no doubt set in in September as all the mills are receiving numerous inquiries for wire products and wire nails. Quotations are unchanged as follows: Wire nails in carload lots, $2.05 per keg; smaller lots, $2.10 and 2.15; plain wire, $2 in carload lots and $2.10 in less than carload lots to retailers; galvanized wire, $2.40 in carload lots; polished staples, $2.20, and galvanized staples, $2.60; painted barb wire, $2.60, and galvanized, 2.90. These prices are quoted on a Pittsburg base plus the actual freight to destination. Cut nails are held at $2.05 in carload lots and $2.10 in less than carload lots, Pittsburg, plus freight to destination.

MERCHANT STEEL.—Manufacturers of crucible steel report that the large machinery manufacturers are making inquiries on large tonnages for delivery through the remainder of the

year and large sales are expected within the next few months. We have the following quotations: Turned cold rolled ground shafting in carload lots 47 off, and in less than carload lots, 42 off; tire steel, 2.25c to 2.30c; toe calk, 2.35c to 2.45c; sleigh shoes, 2.25c to 2.35c; machinery steel, 1.70c; smooth machinery steel, 1.75c. Tool steel, 7 cents and upwards.

Old Material.—The market continues quiet, consumers not buying except for immediate requirements on account of the high prices that are ruling. We make the following quotations, gross tons: Cast scrap, $18 to $19; heavy melting stock, $21 to $21.50; No. 1 wrought scrap, $22 to $22.25; steel rails for rerolling purposes, $23; car wheels, $21.25 to $21.50.

Coke.—For the week ending Saturday August 9 the production of the Upper Connellsville region amounted to 251,246 tons, an increase of nearly 1,000 tons over the production of the previous week. The estimated production of the lower region for the same period is estimated at 44,015 tons, an increase of nearly 2,000 tons over that of the week previous. Despite this enormous production furnaces are compelled to bank continually on account of the shortage of coke, due entirely to the shortage of cars and the congested condition of the railroads. Furnace coke for prompt delivery commands from $3.50 to $3.75 per ton while foundry coke is held at $2.75 to $3.

CHICAGO.

OFFICE OF *The Iron Trade Review*,
519 Monadnock Block, August 19.

There is much apprehension felt in this market over its coke supply. Local receipts for some weeks have been far below the requirements of consumers, and already the stringency is felt in a marked degree. A furnace at Milwaukee and one at St. Louis have been compelled to bank for lack of fuel, and unless an improvement comes shortly, one or two local stacks will also be compelled to suspend. All of them report having exhausted their stocks and are depending on the daily supply to keep in operation. Two Kentucky furnaces and one in Tennessee that have been banked for 10 days have resumed in the past week. Telegrams sent all over the country in search of coke in the last week have failed to bring any great tonnage to light, and such as has been discovered was promptly taken, foundrymen paying as high as $8 a ton. The question of price is no longer a consideration with either foundrymen or furnacemen. This scarcity of fuel has naturally had its effect on the price of pig iron, particularly that which is offered for prompt delivery, which has advanced $1 a ton. "Spot shipment" as now understood by sellers of pig iron, means delivery any time from the present date to April 1st next. Northern iron for shipment in the second quarter of next year, has also advanced $1 a ton.

In finished material, the market has been active all week. Railroads have been heavy buyers of spikes and bolts and bar iron, and there have been some small sales also of standard rails. The demand for bar iron grows heavier each week, and 1.95c is now the established price. A single order of 3,000 tons was closed at this price last week for deliveries extending through the year, and smaller orders aggregating many thousand tons have been closed at the same figure. There is little demand for old material, except for cast and malleable scrap, rolling mills and open-hearth plants not buying anything. Sales of foreign billets to the amount of 10,000 tons were made in this city last week for deliveries at points farther East, shipment to commence in September. About 1,500 tons of British pig iron from Middlesboro and Glengarnock furnaces have also been sold in this market this month, the price being $25.50 f. o. b. Chicago.

Pig Iron.—The present condition of the local market indicates a repetition of the experience of last fall. The scarcity of coke at that time is largely responsible for the present high prices and the extraordinarily heavy demand for spot iron which has existed since the first of January. As a result of the coal strike this summer, this section of the country is on the verge of another coke famine. A furnace at Milwaukee and one at St. Louis have had to shut down in the last two weeks for want of fuel, and local stacks will be affected if the shipments of coke are further decreased. Foundrymen are suffering as keenly, and telegrams are being sent all over the country in search of coke. Some small sales for immediate shipment were made in the past week at $8 a ton. Trading in pig iron has been very active during the week, and very little material is to be had now for delivery in the first half. The two heaviest Southern producers have withdrawn from the market for this period, and more than half of the remaining furnaces in the South are sold up for a like time. The only Northern iron to be had is that made by a local furnace company, which has none to offer for the first four months of the year. Sales in the last week have not been heavy individually, the largest contract of the week reported being for 2,500 tons. The aggregate tonnage, however, has been as large as that for any week during the summer. The possibility of more furnaces going out of blast in the near future has advanced the price of spot iron $1 a ton, and considerably stiffened the price for future delivery. Spot iron is now quoted at $26.15 to $27.15. Considerable foreign iron has been sold in this market, 1,500 tons or more from Cleveland and Glengarnock furnaces in Great Britain having been disposed of at $25.50 a ton, this month. We have advanced our quotations on Northern iron $1 a ton, and quote as follows:

Lake Superior Charcoal	$27 00 to 28 00
Local Coke Foundry No. 1	24 00 to 25 00
Local Coke Foundry No. 2	23 75 to 24 25
Local Coke Foundry No. 3	23 25 to 23 75
Local Scotch Foundry No. 1	23 00 to 24 00
Local Scotch Foundry No. 2	22 50 to 23 50
Southern Coke No. 1	22 40 to 23 15
Southern Coke No. 2	20 65 to 21 65
Southern Coke No. 3	20 15 to 22 15
Southern Coke No. 4	19 65 to 20 65
Southern No. 1, soft	22 15 to 23 15
Southern No. 2, soft	20 65 to 21 65
Southern Gray Forge	19 65 to 20 65
Southern Silveries	22 15 to 23 15
Jackson Co. Silveries	28 00 to 29 00
Ohio Strong Softeners	24 10 to 24 60
Alabama Car Wheel	26 00 to 26 50
Malleable Bessemer	24 00 to 25 00

Bars.—All the local mills report that buying has been quite active during the past week, and the price has stiffened accordingly. None are selling at less than 1.95c, and all the manufacturers anticipate an advance in the near future. An order for 3,000 tons was closed at this figure, and the company that received it reports having inquiries aggregating 20,000 to 30,000 tons which it expects to close on the same basis during the coming week. Most of the iron being sold is for deliveries extending throughout the year, the orders coming from concerns which have found that their requirements will largely exceed the tonnages specified in their contracts. Manufacturers expect this fall the heaviest trade in years, reports from agricultural districts indicating that the crops were never better. We quote Chicago delivery, Bessemer steel, 1.75c to 1.85c; angles, less than 3x3, 1.85c; iron, 1.95c; hoops, 2.05c. Prices out of store, steel, 2c to 2.10c; iron, 2.20c to 2.25c; hoops, 2.40c to 2.45c; angles, 2.50c to 2.60c.

Sheets.—There is little change to report. Mills are receiving plenty of business, though their inability to give prompt deliveries deflects considerable tonnage into jobbers' channels, which otherwise would be booked by them. We quote No. 27 black, Chicago delivery, 3.15c to 3.25c; galvanized, 4.40c to 4.45c; out of store, No. 27 black, 3.35c to 3.50c; galvanized, 4.60c to 4.75c.

Structural Material.—There has been little business placed during the past week. Specifications for two large buildings to be erected in this city have been received, though it is not probable that orders will be placed for several weeks. Some foreign material has been sold, not exceeding 500 tons. We quote mill prices as follows: Beams, 15 inches and under, 1.75c; 18 inches and over, 1.85c; structural angles, 3x3 to 6x6, 1.85c; angles, channels and tees, smaller than 3 inches, 1.85c base; plates, 1.75c. Prices on lots from store are based on the necessities of buyers and according to the size of order. Store prices vary from 2½ to 4 cents a pound.

Billets.—Local jobbers report the sale of 10,000 tons of foreign billets for delivery in the East, on the basis of $31 Chicago. Several hundred tons of domestic open-hearth forging billets have also been sold at $38 per ton.

Rails and Track Supplies.—Railroads have been heavy buyers during the week of spikes, bolts and other track supplies. Some small orders have also been placed for rails of standard sections. The local mill reports that its capacity on the latter product is taken up to October, and is refusing all further business. Relaying rails are in heavy demand and find ready sales as soon as offered. We quote heavy sections, $28;

second quality, $27; light rails, 45 pounds, $34 to $35; 12 pounds, $40 to $41, with regular differentials for intermediate sizes; out of store, $45 to $50; splice bars, 2.25c; spikes, carload lots, 2.45c to 2.55c; track bolts 3½x¾, with square nuts, 3.05c per 100 pounds; with hexagon nuts, 3.20c with usual differentials for other sizes.

MERCHANT STEEL.—There is no change to report. None of the mills is seeking business, and buying is limited to jobbers that have stocks on hand. We quote mill shipments, Chicago delivery, as follows: Smooth finished tire steel, 1.95c to 2c; open-hearth spring steel, 2.65c to 2.75c; sleigh shoe, 1.75c to 1.80c, flat sizes; concave and convex, 2c; out of store, 2.15c; cutter shoe, 2.40c to 2.60c; machinery steel, 2.15c to 2.25c, base; plow steel, 2.50c and upwards, according to quality; toe calk, 2.25c to 2.35c; out of stock, 3c to 3.10c; ordinary tool steel, 6c to 7c; specials, 13c and upwards; less than carload lots, 5 percent to 10 percent higher; cold rolled shafting, carload lots, 50 percent off, Chicago; less than carload lots, 45 percent off, Chicago.

CAST IRON PIPE.—Outside of the general run of orders, there is nothing to report. Prices are stiff and are being firmly maintained. We quote 4-inch water pipe, Chicago delivery, $35.75; 6-inch and larger, $33.75 to $34; gas pipe, $1 a ton higher.

MERCHANT PIPE.—Demand continues quiet, which is not unusual for the summer months. Jobbers report a fair number of orders. Prices are as follows:

MERCHANT PIPE, RANDOM LENGTHS.

(Jobbers, Chicago Basing Discounts.)

	Black Percent.	Galv. Percent.
⅛ to ½ in. inclusive	58½	46½
¾ to 12 in. inclusive	65½	53½
(Consumers, Chicago Basing Discounts.)		
⅛ to ½ in. inclusive	56½	43½
¾ to 12 in. inclusive	63½	50½

BOILER TUBES.

Steel.

	Percent.
1 to 1½ in.	35
1¾ to 2½ in.	45
2¾ to 5 in.	55
6 to 13 in.	47½

Iron.

	Percent.
1 to 1½ in.	35
1¾ to 2½ in.	32½
2¾ to 5 in.	42½

PLATES.—Mills report that they are extremely busy, specifications coming in heavily. No orders are being taken for next year's delivery, and such new business as comes forward is taken care of by jobbers. We quote mill prices, Chicago delivery: Tank steel, ¼-inch and heavier, 1.75c to 2.15c; flange steel, ¼-inch and heavier, 1.85c to 2.25c; from stock, tank steel, ¼-inch and heavier, 2.30c to 2.50c; 3-16, 2.40c to 2.60c; No. 8, 2.45c to 2.65c; flange steel, 2.50c to 2.60c.

WIRE AND WIRE NAILS.—With the gradual completion of harvesting, demand for all kinds of wire products is increasing tremendously. Local manufacturers anticipate the heaviest fall trade in years, and are making strenuous efforts to catch up on undelivered orders. Prices to jobbers are as follows: Smooth wire, carload lots, $2.10; painted barb wire, $2.70; galvanized barb wire, $3.00; wire nails, $2.15; staples, $2.25. Retailers' prices, 5 cents higher than these.

COKE.—The number of cars received daily in this city is far below the requirements of this section, and both furnacemen and foundrymen will soon be facing a temporary shut-down of their plants unless the shipments increase. Telegrams have been sent by various dealers to all parts of the country in search of coke, but not much has been obtained. As high as $8 per ton has been paid for a carload by a foundryman needing the fuel badly, while $6.50 to $7 is the ruling quotation for spot delivery. For future delivery, we quote 72-hour Connellsville foundry, $5.75 to $6; Virginia and West Virginia, $5.50 to $5.75.

OLD MATERIAL.—With the exception of all kinds of cast scrap, there is little demand for old material. All the rolling mills and open-hearth plants are well supplied for some months to come and are out of the market. Railroads and country dealers are offering material freely. We have revised some of our quotations, and quote as follows:

Old iron rails	$24 00 to 24 50
Old steel rails, long lengths	22 50 to 23 00
Old steel rails, short lengths	18 00 to 19 00
Relaying rails	31 00 to 32 00
Old wheels	20 00 to 21 00
Heavy melting steel	17 25 to 17 50
Mixed country steel	14 50 to 15 00

The following are selling prices per net ton:

No. 1 R. F. wrought	$20 00 to 20 50
No. 2 R. F. wrought	18 50 to 19 00
Dealers' forge	15 50 to 16 00
No. 1 busheling	14 50 to 15 00
No. 1 R. R. and Machine Cast	15 00 to 15 50
Railway malleable	15 50 to 16 50
Country malleable	14 50 to 15 00
Iron axles	24 00 to 24 50
Steel axles	20 50 to 21 00
Cast borings	10 00 to 10 50
Wrought turnings	14 00 to 14 50
Iron axle turnings	14 50 to 15 00
Steel axle turnings	13 50 to 14 50
Stove plates	11 50 to 12 00
Old iron splice bars	20 50 to 21 00

CLEVELAND.

OFFICE OF *The Iron Trade Review*,
1064 ROSE BUILDING, AUG. 20.

The announcement Monday that the carrying charge on ore had been advanced from 55 to 60 cents at Escanaba and from 75 to 80 cents from Duluth and Ashland caused some commotion among ore men. Investigation developed that, while the 60-cent raise from Escanaba may stick, it is not at all probable that the vessel men will get 80 cents from the upper ports. So far, only one cargo from the head of Lake Superior has paid 80 cents, and several vessels have been placed this week at the old rate. The raise of rates was not entirely unexpected, as it usually comes when the grain begins to move, but it came a little earlier than usual, the movement of grain being the old crop, from Chicago. The grain movement is not yet heavy and will not be for some time. The docks are in bad shape, many vessels being delayed. While not much ore is being sold at present, there are a fair number of inquiries and the opinion is confidently expressed that prices will be raised soon. Prices on some kinds of ore are now higher than they were last spring.

PIG IRON.—There is a brisk demand for foundry iron, inquiries coming in for the second half of the year from foundries fully supplied for the first half. Prices remain firm, with some concession for iron for later than July. High silicon iron in the Jackson county district is selling 50 cents higher. Foundries that failed to buy enough to meet their demands for the present year are having the greatest trouble in getting iron even at very high prices and are not in a very amiable frame of mind over present conditions. In considering the question how long the present demand for foundry iron will last, those who believe a break must come in prices within a year argue that when the foundrymen begin to base charges for their products on present high prices of iron, consumption will be checked, but to this argument the reply is made that consumers are showing no inclination to stop buying and will not unless prevailing prosperity should be checked by unexpected causes, political or otherwise. The general opinion is that prices are bound to go somewhat higher and that there will be no slump for at least a year. We quote prices as follows, the lower figures on foundry iron being for shipment in the first half of 1903 and the higher figures for deliveries in the first two or three months of the new year:

Bessemer	$21 75 to 22 25
No. 1 Strong Foundry	22 25 to 22 75
No. 2 Strong Foundry	21 75 to 22 25
No. 3 Foundry	21 25 to 21 75
Scotch No. 1	22 25 to 22 75
Scotch No. 2	21 75 to 22 75
Gray forge, Valley	20 00 to 20 50
Lake Superior Charcoal	24 00 to 26 00

FINISHED MATERIAL.—A good business in finished material is being done. A considerable sale was made the past week of structural material for bridges. Prices of tank steel range from 1.70c to 1.85c Cleveland. The base price for bar iron is maintained at 1.80c Pittsburg and no special effort is being made to sell at that price, the opinion being expressed that the price will be 2 cents this fall. Sales out of store, Cleveland, are on a basis of 1.90c and 2c for iron and steel. We quote steel bars at 1.60c for Bessemer and 1.70c for open-hearth, Pittsburg. Sheets are still weak, especially the lighter grades. We quote 2.10c to 2.15c Cleveland for 3-16-inch and heavier. Cleveland prices are on the following basis on mill sales of black sheets: No. 24, 2.90c to 3c; No. 26, 3c to 3.10c; No. 27, 3.10c to 3.20c; and the following prices out of stock: No. 10, 2.35c to 2.50c;

No. 12, 2.45c to 2.60c; No. 14, 2.55c to 2.70c; No. 16, 2.95c to 3c; No. 18, 3c to 3.15c; No. 20, 3.05c to 3.20c; Nos. 22-24, 3.15c to 3.30c; Nos. 22-26, 3.25c to 3.40c; No. 27, 3.35c to 3.50c; No. 28, 3.45c to 3.60c, for one pass cold rolled. On galvanized sheets Cleveland prices to consumers are as follows for carload lots: Nos. 10 and 11, 3.15c; Nos. 12 to 14, 3.25c; Nos. 18 to 21, 3.55c; Nos. 22 to 24, 3.85c; No. 27, 4.53c; No. 28, 4.60c. We continue to quote 1.70c Cleveland for beams and channels for delivery in 1903, business for 1902 being through jobbers at prices from 2½ to 3½c according to sizes and quantity.

OLD MATERIAL.—There has been a fair demand for mill scrap, wrought turnings and cast borings. Old iron rails have been dull. We revise Cleveland prices, all gross tons, as follows:

Old iron rails	$25 50 to 26 50
Old steel rails (6 ft. and over)	22 00 to 23 00
Old steel rails (6 ft. and under)	21 00 to 22 00
Old car wheels	20 00 to 21 00
No. 1 R. R. wrought scrap	22 00 to 23 00
Mill scrap	19 50 to 20 50
No. 1 machine cast scrap	18 00 to 19 00
Iron axles	28 00 to 29 00
Axle turnings	18 00 to 18 50
Wrought turnings (free from cast)	15 50 to 16 00
Cast borings	11 00 to 11 50
Uncut wrought iron boilers	12 00 to 13 00
Steel boiler plates	17 00 to 18 00
Grate bars	12 00 to 13 00
Pipes and flues (clean)	17 50 to 18 50
Tank iron	17 00 to 18 00
Hoop and band iron	13 50 to 14 50
Sheet iron	11 50 to 12 00
Wrought drillings	15 00 to 16 00
Malleable iron (railroad)	20 00 to 20 50
Malleable iron (agriculture)	17 50 to 18 00
Stove plate	13 00 to 14 00
Heavy steel	19 00 to 20 00

CINCINNATI.

August 19.

Less offerings and higher prices rule this week in the pig iron market. A large demand and a firm market about tells the story with regard to finished material. Business all around is good and all indications point to a continuance of the satisfactory conditions through the fall. There is still some complaining about the deliveries of all kinds of finished material, though it is hoped that the end of the active building season will allow the mills to get caught up a little with their business. Iron stores report that they are having just as good a demand all together as they have had during the past six or seven months and in some departments they are expecting to be even busier.

PIG IRON.—It is becoming a problem again as to getting pig iron. A short time ago it was hard to get iron for delivery this year. Now it is hard to get all that one wants for delivery any time during the first half of the new year. One of the largest producers has practically withdrawn from the market and another which has been quoting iron on the basis of $17 for No. 2 is said to have sold the last of its iron at that price. Offers of $18.50 for No. 2 for delivery during the first half of 1903 have been made and refused by the furnaces. It is also said that an offer the past week of $19.50 for all the iron that could be made by a certain producer was refused by that producer.

Some agencies report a fair run of business for the past week but it has been largely of business that could be handled only in small quantities. Orders are for iron to be delivered well over the first half of the year and in some cases the bulk of the iron moving is confined to the lower grades and odd lots.

It is in order to mark up the prices on all grades somewhat and the following prices are such as maintain for delivery during the first half of the year:

Southern Foundry No. 1	$21 25 to 22 75
Southern Foundry No. 2	20 75 to 22 25
Southern Foundry No. 3	20 25 to 21 75
Southern Foundry No. 4	19 75 to 21 25
Southern Foundry No. 1, soft	21 25 to 22 75
Southern Foundry No. 2, soft	20 75 to 22 25
Gray Forge	20 00 to 21 00
Northern Foundry No. 1	26 10 to 26 60
Northern Foundry No. 2	25 10 to 26 10
Southern C. W. iron	26 25 to 26 75
Malleable coke iron	23 75 to 24 25

Quotations on spot iron range from $23.25 to $23.75 for No. 2 at Cincinnati.

FINISHED MATERIAL.—There is no new story to tell about finished material. At the same prices that have been ruling for many months the demand for all kinds of material keeps up and especially the manufacturing lines that use iron and steel are in the market for their various sorts of metal without abatement. It is also expected that there will be a better demand from some of the lines that have been rather quiet for a time, such as the vehicle makers. Building operations are now in the state where the builders are after material that they ordered long ago rather than material that they may want in the spring and summer. Still it must be said that the inquiries for delivery next year indicate that there will be a good business. Prices remain unchanged, bar iron being quoted at 1.92c and steel bars at 1.72c, both being quoted at 2.20c out of store. Angles are 2.35c and 2.50c out of store. Sheets are quoted at 2.50c for No. 12 and 2.35c for No. 10.

OLD MATERIAL.—There is nothing that can be said about the market for scrap that would be in any wise interesting. The demand is but fair, all offerings being readily absorbed but not by concerns that are overly anxious to get the material.

Old No. 1 Wrought Railroad, net tons	$20 75 to 21 25
Cast Machine and Foundry, net tons	14 75 to 15 75
Old Iron Rails, gross tons	25 00 to 26 00
Old Steel Rails, gross tons	24 00 to 25 00
Old Short Lengths, gross tons	17 75 to 18 25
Old Iron Axles, gross tons	27 00 to 28 00
Old Iron Car Wheels, gross tons	19 50 to 21 00
Stove Plates, gross tons	11 75 to 12 00
Wrought Turnings, net tons	14 50 to 15 50
Cast Borings, net tons	9 50 to 9 75

NEW YORK.

OFFICE OF *The Iron Trade Review*,
ROOM 1909, NO. 150 NASSAU ST., August 19.

PIG IRON.—With the majority of Southern furnaces out of the market so far as sales of their output for the first six months of next year are concerned, and with Northern furnaces manifesting the greatest unwillingness to do any business for the same period, the pig iron market at present certainly presents a unique situation. Private advices from Birmingham confirm the impression recorded in this column last week relative to higher prices being among the probabilities of the near future. These advices indicate that it is an absolute impossibility to purchase any No. 2 Southern Foundry for delivery for the first three months of next year unless on the basis of $18 at the furnace. Sales of $17.50 for the same grade are now regarded as a thing of the past, if for no other reason but for the fact that the majority of furnaces have disposed of the major portion of their output already. That there will be some No. 2 Southern Foundry for sale for the first six months of 1903 can be counted upon for a certainty. One large interest, for example, will have at least 65,000 tons to dispose of. With the conditions stated at the opening of this dispatch, it is superfluous to state that the buying for 1903 delivery has declined. Interest under the circumstances is chiefly centered in when the furnaces will again open for 1903 business. The writer made a special effort to obtain some information on this point, but was unsuccessful. Both officers and sales agents of companies were seen, and all declared that it was a matter of conjecture when they would do so. Nevertheless inquiries continue to be made. Those who neglected to supply some portion of their needs for early delivery next year at the opening prices specified by the furnaces, are now making strenuous efforts to purchase at or near those prices, but a deaf ear apparently is turned to their entreaties. The tendency to await future developments has undergone no diminution. In fact it may be said that the generality of producers and consumers alike may be compared to Micawber in their inclination to wait for "something to turn up." It is evident some foreign furnaces are drawing some deductions from the high prices being quoted for domestic pig iron for delivery next year. This is especially true of Scotch furnaces, and particularly the Glengarnock furnace. The latter has opened its books for 1903, on the basis of $23.75 for No. 1 Foundry deliverable in New York, and $22.75 for No. 3 Foundry deliverable in New York also. These prices are far in excess of that demanded for domestic material. For example, with No. 2 Southern foundry selling at Birmingham at $18, and with $3.75 per ton charged for freightage to New York, that would make delivery in New York at $21.75. In comparison with No. 1 Glengarnock, this makes the latter exactly $2 dearer on New York delivery from January to March. Some sales of Northern irons for next year are being made daily, but in small quantities, at prices averaging from $21.50 to $22 at the furnace.

There is no change in the market for domestic spot material,

the scarcity of which has become so acute as to make some remark that it is practically unobtainable. A carload probably can be had here and there, but the price demanded is almost of the prohibitory order. Foreign irons are reaching seaboard ports in good quantities, and local consumers with this year's wants to supply find in them their only hope. Prices show an inclination to stiffen, especially for superior grades, with prices for shipment the latter part of this month and the early part of next averaging from $21.50 to $23, New York delivery. Prices for American irons for New York summer delivery are quoted nominally as follows: No. 1X Northern, $23.50 to $25; No. 2X Northern, $22.75 to $23.50; No. 2 plain Northern, $22.25 to $22.50; No. 1 Foundry Southern, $22.00 to $23; No. 2 Foundry Southern, $21.75 to $22.50; No. 3 Foundry Southern, $21.25 to $22.75; No. 4 Foundry Southern, $20.25 to $21.25.

FINISHED IRON AND STEEL.—There has been no abatement in the demand for structural shapes. High premiums for spot delivery continue the feature. In sheared steel plates business is especially brisk, the demand from ship and bridge building sources being the greatest ever known. The sheet steel market is characterized by both dullness and weakness, and concessions in prices are of frequent occurrence. New York prices are as follows: Beams and channels, 15 inches and under, 1.75c to 1.90c; angles, 3 to 6 inches, 1.75c to 1.90c; zees, 1.75c to 1.95c; bulb angles, 2.05c to 2.35c; deck beams, 2.05c to 2.25c; sheared steel plates, tank, 2.10c to 2.15c; flange, 2.25c to 2.30c; firebox, 2.30c to 3.50c; refined iron bars, 1.95c to 2c; soft steel bars, 1.95c to 2.10c; steel sheets, in carloads, New York; No. 28, black, 3.18c to 3.25c; No. 28, galvanized, 70, 10 and 5 off.

PHILADELPHIA.

August 19.

So much difficulty is encountered in getting fuel that many furnaces are banked, others are running irregularly and there is hardly one which is doing its best work. Foreign iron, although it does not fully meet requirements, is a decided help. For the present, no marked change is expected in the pig iron situation. There will probably be none until the strike is settled.

PIG IRON.—There are no new features whatever, and until the coal strike is settled there is not likely that there will be anything of importance. The furnace output during July shows a decrease of 80,000 tons, compared with the month previous, and it is hardly likely that any recovery will be made until the miners get to work again. This may be soon, or it may continue several weeks longer, but after being out three months it cannot be very much longer. The chances of larger supplies of pig iron during the remainder of the year, however, are not encouraging, so that prices of that article are likely to rule high during that period. They would be a good deal higher than they are if it were not for foreign iron, which will be shipped in large quantities during the remainder of the year. Consumption continues to be very heavy, although it has been materially less than it would have been; if the strike had not caused such a scarcity of fuel, that work could not be carried out systematically or economically. Prices of pig iron are about the same as they were a week ago, deliveries in consumers' yards being quoted at $23.50 to $24 for No. 2 X foundry, covering the remainder of the year, $22.50 to $22.75 for the first quarter of 1903, and $22 to $22.50 for the first six months, and $21.50 to $21.75 for the last six months. Middlesboro iron in small lots, $21 to $21.50 spot delivery, or about $19.50 for shipments in cargo lots. Scotch irons, spot deliveries, $23 to $24.

BILLETS.—More activity may be reported in steel. Some large deals are under negotiation for foreign material, and if not already closed, they soon will be. Steel is wanted, and as prices are very much lower than the American article, there is no reason why it should not go through, although of course, specifications, dates of shipment and other details require time to arrange satisfactorily. Prices on 5,000-ton lots and upward range from $28.75 to $29 c. i. f. duty paid, asked, but buyers expect to do $28.50 if not better. American steel nominal at $32 to $33.

FINISHED MATERIAL.—Business is satisfactory in most departments but there are some laggards. Tin plates, black sheets, wire and wrought iron pipe are all dull, and prices inclined to shade off, but this is regarded as a temporary condition which will soon give place to a renewed activity. Plates are active and firm, and prospects for a steady run of business are unusually favorable. Structural material is also in good demand, and although imports are large, everything is taken at full prices. Bars are fairly active, some report plenty of orders, others are rather anxious to get in additional business as the output is very large, and is expected to be larger in the near future. Prices steady as follows: For deliveries in Philadelphia or near-by points (carload lots, a minimum quantity). Refined bar iron, 1.95c to 2c; steel bars, prompt deliveries, 2c to 2.1c; plates, one-fourth inch and thicker, 2c to 2.1c; beams, channels, angles, etc., 2.25c to 2.50c.

OLD MATERIAL.—Steel is firm, but prices are about as they were. Old steel rails, $21.50 to $22.00; miscellaneous heavy steel scrap, $20.50 to $21.25; low phosphorus scrap, $27.50 to $28.25; old steel axles, $27.50 to $28; old iron axles, $31 to $31.50; old iron rails, $25 to $26; old car wheels, $20.50 to $21; choice scrap railroad No. 1 wrought, $23 to $24; country scrap, $18.50 to $19.50; machinery cast, $18 to $19; No. 2 light scrap, forge, $17 to $18; No. 2 light scrap, ordinary, $15 to $16; wrought turnings, $16.75 to $17.50; wrought turnings, choice heavy, $18 to $19; cast borings, $10.50 to $11; stove plate, $13.75 to $14.25.

The New Plant of the Clairton Steel Co.

(Special Telegram.)

PITTSBURG, Aug. 20.—The new plant of the Clairton Steel Co., a subsidiary company of the Crucible Steel Co. of America, located at Clairton, Pa., will be placed in partial operation early in September. Five of the twelve 50-ton open-hearth furnaces will commence operations at that time, and the remainder of the open-hearth plant and rolling mill department will be placed in operation early in October. One blast furnace will be completed in January and the remainder of the blast furnace plant will be placed in operation next March.

New Car Wheel Plant.

(Special Telegram.)

PITTSBURG, Aug. 20.—The Pennsylvania Malleable Co., of McKees Rocks, Pa., has completed surveys for the erection of a car wheel plant adjoining the present malleable plant. The foundry will have a daily capacity of about 600 wheels per day. It is probable that all the wheels manufactured will be used by the Standard Steel Car Co., whose new plant is under erection at Butler, Pa.

President Charles M. Schwab, of the United States Steel Corporation, will sail for Europe shortly, passage having already been booked. Mr. Schwab will spend some time abroad enjoying a much needed rest. Reports that he has resigned the presidency of the United States Steel Corporation have been officially denied.

A company will shortly be incorporated at Cuyahoga Falls, O., with a capital of $300,000 for the purpose of erecting and operating a nut, bolt and rivet plant. The promoters of the company are J. E. Bell, formerly general sales agent of the Youngstown Mfg. Co., and Charles R. Roof, formerly general superintendent of that plant. Two buildings will be erected respectively 80x280 and 50x100 feet. The company is in the market for all the machinery required in the plant.

The Columbia Steel Co. has advertised for bids for the erection of its buildings at Elyria, O. The plans call for a main building 400x800 feet and other buildings for shipping and store room, engine and boiler houses. The product of this mill is to be cold rolled steel sheets, such as are used in typewriters, sewing machines, telephone fixtures, and hardware specialties. Walter P. Rice, of Cleveland, is the engineer, and J. C. Smith, of this city, is the manager.

The new steamer, James Hoyt, was unloaded Aug. 14 at Conneaut by the Hulett automatic unloaders. The test proved highly successful, 98 percent of the ore being removed without shoveling. The vessel was cleared up in exactly 5 hours.

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AUGUST 21, 1902

GROWTH OF THE BY-PRODUCT COKE INDUSTRY.

It is a long time, as American iron and steel developments go, from the agitation of the early nineties in favor of by-product systems of coke making for American coal. With much rehearsing of statistics and cost sheets the early advocates of by-product coke showed that millions of dollars were being foolishly wasted by American coke makers employing the beehive oven; but their demonstrations seemed to fall on deaf ears. Now, with so little noise that few grasp the magnitude of the impending change the by-product method is being adopted on really a commercial scale. It is safe to say that the majority of the blast furnaces now being erected, expected to depend on fuel other than Connellsville, will use by-product coke. At Buffalo, Sharon, Detroit and elsewhere by-product coke will be the reducing agent. At Buffalo the operations are of course the most extensive, and it is understood that coal from Indiana county, Pa., where large coal land purchases have been made, will be used. The coal will probably have to be washed, to remove the sulphur, but that is regarded as merely an incident, since the coal must be crushed in any case.

It is not difficult to reconcile the claims of early American investigators of German by-product coke making with the non-adoption of the principle a decade ago and its ready adoption now. The proposition then was assumed to mean its adoption in the Connellsville region. In the intervening years the Connellsville coke output has not increased as rapidly as total coke consumption, and other districts are more prominent as coke producers. No manufacturer then considered that he had a market for a given by-product if that market lay across the ocean. Today it is different. If the European market is there it is sufficient, and there is now faith that American demand will spring up for any product that is used in any country. Many of the products of by-product coke ovens will find a ready market in this country, including tar and ammonia in particular. For others there is at least a limited demand. It would offend the esthetic sense to catalogue the soda-water flavors which derive their raw materials from the by-product ovens of Germany.

Not much less than ten years ago American blast furnace builders were filled with ideas of very large furnaces and enormous individual outputs. Views have changed in the past couple of years. Blast furnaces have their ups and downs in common with many other things material. The older men in the trade will readily recall the craze for high furnaces, reaching even a hundred feet, which seized the industry some thirty or thirty-five years ago, and the dismal failures attending such efforts. The hundred foot stack of the past few years has not been a dismal failure, but the cost sheet and other considerations have not shown such advantages as to put out of the running the slightly smaller furnace, operated more slowly and with better control and more regular results. For the very heavy burden and very rapid driving by-product coke may not have been adapted, but for what appears to be the stack of the future it is better adapted. Furthermore, it is in keeping with modern systems of cost accounting to adapt the furnace to the fuel if as seems probable there is ultimate economy in so doing.

Statistics of production to the close of 1901 do not reflect the enormous expansion in by-product coke making which current erection of coke ovens shows. In 1900 there was produced 1,075,727 short tons of by-product coke, or 5.24 percent of the total coke production of the year. In 1901 the production was 1,179,900 tons, or 5.41 percent of the total. At the beginning of this year, however, there were in process of erection 1,533 by-product coke ovens, or 30 percent in number of the total number of coke ovens being built. Their relative capacity, of course, would be much greater, and since the beginning of the year work has been started on many more. The regular ovens in blast in 1901 averaged 342 tons each for the year, while the by-product ovens averaged 1,013 tons each, or nearly three times as much as the beehive. At this rate the by-product ovens in course of erection on January 1 last would produce two-sevenths more coke than the beehive ovens then being erected, but of course such a comparison can be only an approximation.

A REVOLUTIONARY SHEET AND TIN PLATE PROCESS.

It has been more than once exemplified in the history of the iron and steel trade that the rush of many would-be inventors towards the attainment of a desired end has resulted not only in failure but in a discouragement to future efforts which has actually delayed the desired accomplishment. When the establishment of the tin plate industry on American soil was agitated in the early nineties inventors were prolific of plans for the production of the material at actually less cost than in Wales. Nor were they all hare-brained enthusiasts. One man invented and patented a continuous system for rolling sheets at the same time that he invented and patented a mill for the production of another and quite different steel product. He was more sanguine of the tin plate invention than of the other, yet the one was so admittedly impracticable that it was never tried, while the other, in which the inventor had less faith, has so stamped itself upon the in-

dustry in question that one scarcely thinks of this industry without recalling his name.

The early failures, if they could be dignified into calling them failures, to produce tin plate or thin sheets in a radically different manner, so impressed manufacturers that the actual application of a new principle has without doubt been delayed. An incubus has rested upon the industry and it required courage to suggest a change. There is little doubt now that the day of "revolution"—and we mean to be conservative in using the word—is at hand. Experiments will be commenced within the next two months on an entirely new process, and that this process is seriously regarded is evidenced by the fact that the United States Steel Corporation months ago authorized an expenditure running into six figures for the purpose of a commercial trial, all of which would be practically wasted, in addition to the destruction of existing plant involved, if the experiment should prove a failure. It is more than a year since the first plans were laid, and over six months since the work of construction was begun.

Should this new process be a success, and the good judgment of those who are back of it encourage the belief that it will, the changes which would follow would affect not only the technical side of tin plate and sheet manufacture, but would involve labor questions and the relations of the sheet and tin plate companies to their new and now numerous competitors as well. The new process would be controlled by the steel corporation and would involve a saving in cost of manufacture so great as to practically eliminate competition. It would be possible to capture the tin plate drawback market without difficulty and probably even invade foreign markets with sheets and tin plates. The skilled tin plate workmen may find the taking of the drawback trade a matter not dependent upon their co-operation.

These are possibilities of the near future, and in any event it is certain that the long-delayed improvement in methods of rolling sheets and tin plates cannot much longer be put off. When America has given to the world new plate, beam, rail and rod mills with much larger output and much greater economy than former methods could show, it is not unreasonable to hope that the same can be done in sheets and tin plate, albeit the problem has always seemed more difficult.

The Philip Carey Mfg. Co., of Lockland, O., has secured the contract to furnish and apply the 85 percent carbonate of magnesia pipe covering at the power station of the Manhattan Railway Co., at 74th and East River Sts., New York. This is one of the largest contracts closed by any pipe covering manufacturer in recent years and amounts to approximately $25,000. Other contracts closed recently are the Adams, Stokes, Astor and Manhattan buildings in New York; the Colorado plant of E. H. Dyer & Co., of Cleveland; 18 lake vessels built by the American Shipbuilding Co., of Cleveland, and 21 cotton mills.

The Vulcanus Forging Co., of Cleveland, is working under the handicap of crowded facilities and is in the market for a good building site. The exact location is of little consequence provided the railway facilities are excellent, labor plentiful and the other requisites to a 20th century factory are available.

The strike at the plant of the Ashland Steel Co., Ashland, Ky., has been declared off by the Amalgamated Association of Iron, Steel and Tin Workers, and the mill has resumed operations in full. The strike was declared some time ago, owing to the refusal of the company to sign the scale, although the offer of paying the scale wages was made.

RESIGNATION OF COL. F. J. HEARNE, PRESIDENT OF THE NATIONAL TUBE CO.

(Special Telegram.)

PITTSBURG, Aug. 20.—Col. Frank J. Hearne, president of the National Tube Co., resigned at the annual meeting in Jersey City yesterday. His retirement was the result of failing health, he having been ill for some time. Complete rest is necessary. First Vice President Wm. B. Schiller was elected president, Second Vice President W. H. Latshaw becomes first vice president, John D. Culbertson becomes second vice president and A. S. Mathewson third vice president. Edward Worcester, general sales agent of the company, was elected a director to succeed Col. Hearne, and Wm. Murray, attached to the treasurer's office, was elected to succeed William Nelson Cromwell, who resigned from the directorate.

Mr. Hearne said, "When in New York last week I arranged with the chairman of the executive committee of the United States Steel Corporation that my name should not be presented for re-election to the board of directors of the National Tube Co., and that I should be permitted to retire after a very active business life of 36 years. This is most agreeable to myself and family and has been suggested by my physician for more than a year past. My relations with the officials of the steel corporation and its constituent companies, including the National Tube Co., are most cordial. I am especially pleased that Mr. Schiller has been selected to fill the vacancy as we have always worked together most harmoniously and consider him in every way splendidly equipped for the position. It is my intention to continue my residence in Pittsburg and devote more time in the future to my personal affairs."

Prior to the formation of the National Tube Co. Col. Hearne was head of the Riverside Iron Co., of Wheeling, W. Va.

Grossly exaggerated reports have recently been published concerning the plans of the American Steel & Wire Co. to care for injured employes. The company has no intention of establishing hospitals, but is merely carrying out its plan of having at each plant a properly equipped room in which attention can be given injured employes temporarily until they can be removed to hospitals. The company will continue its policy of using public hospitals in cities where plants are located.

A story that the United States Shipbuilding Co. had made a proposition to the American Shipbuilding Co. to purchase the latter's common stock at $100 and its preferred stock at $150, was published in Cleveland last Saturday and was promptly denied by officials of the latter company. Stock of the American Shipbuilding Co. has, however, advanced this week, but there is nothing to substantiate the report of the proposed sale or of the plan to convert a large amount of common stock into bonds.

The Lincoln Stove & Range Co., with headquarters in Detroit and factories in Detroit and Toledo, has decided to locate a factory in Fremont, O. Work has commenced on the foundry and machine shops and the new concern will be in operation during the early winter. All kinds of steel ranges and stoves are manufactured and 50 men will be employed at the start.

The Standard Steel Tube Co. will be organized in Toledo to manufacture steel tubing for bicycles and bedsteads, etc. Orders amounting to $50,000 are now booked.

The largest cargo of iron ore ever taken out of Two Harbors was loaded there Aug. 12 on the big steel barge John Smeaton. It consisted of 7,653 gross tons, or 8,751 net tons. With this immense cargo aboard the Smeaton draws 18 feet 6 inches of water.

The tin houses of all the plants of the American Tin Plate Co. at New Castle, Pa., are still in operation, but as soon as all the black plate is worked up they too will shut down for an indefinite period.

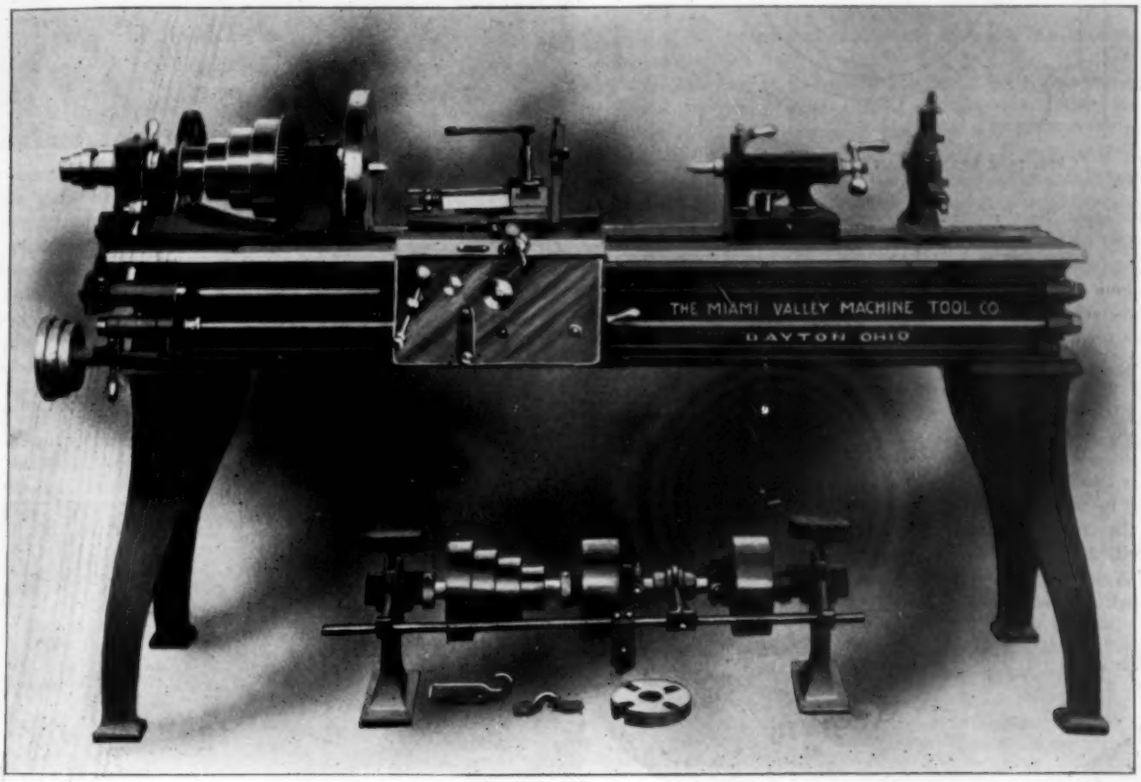
The core boys employed by the Union Malleable Iron Works, Moline, Ill., went on a strike last week on account of the refusal of the company to discharge the girls employed in this department.

A NEW 13 1-2 INCH ENGINE LATHE.

The Patterson Tool & Supply Co. of Dayton, O., is placing on the market a 13½-inch by 6-foot, compound rest engine lathe which is shown in the accompanying illustration. The tool is of pleasing design and the designer has aimed at producing a rigid machine by a liberal and skillful distribution of metal.

The spindle is high-grade steel with ground bearings and phosphor bronze boxes. The cross feed is provided with graduations and the chasing block is always in working position on the lathe and not a block that may be mislaid. A mischance that the mechanic realizes is usually destined to happen at the most inconvenient time. It is impossible to throw in the feed rod and screw feeds at the same time. Large centers are used and there is no bushing in spindle, a safety plug being provided in order to avoid any possibility of an accident when the center is removed. The tailstock is of the overhanging style, to give a liberal amount of freedom to the movements of the compound rest, and has set over.

The feeds are reversible in head and apron and the power cross feed may be thrown in or out by moving a button. All planed surfaces are polished. The head and tailstocks are fitted to the bed with a V at the rear and a flat bearing in front, this design permitting the cross bridge of the carriage



A NEW 13½-INCH ENGINE LATHE.

to be heavy and rigid. In addition to the belt and rod feed, a positive feed is readily obtained by engaging the gear on lead screw with the one on feed rod.

A lock screw is fitted to the carriage and the latter has V bearings in front and flat bearing in rear and is firmly gibbed. The sliding bearings on all the V's are carefully fitted to completely cover the surfaces and avoid wearing ridges in them. The countershaft is provided with double friction pulleys; simple in construction and easy of adjustment. Great care has been taken to ensure excellent facilities for lubricating all bearings, particularly those in the apron. The compound rest is graduated in degree.

The principal dimensions are: Swing over bed, 13½ inches; swing over carriage, 8⅞ inches; distance between centers, 3 feet 10 inches; hole through spindle $1^{1}/_{16}$ inches; No. 4 Morse taper in spindles; size of lathe tool, ½x1 inch; face of cones, $1^{15}/_{16}$ inches for 1¾-inch belt; lathe cuts threads, 4 to 64 including 11½; net weight of 6-foot lathe, 1,200 pounds.

SPECIFICATIONS FOR MARINE BOILERS.

At the recent convention of the American Boiler Manufacturers' Association, held in Atlantic City, considerable discussion was developed on the labor situation, the causes and remedy for strikes, etc., and it is quite possible that some organized effort will shortly be made by the association to combat the influence of sympathetic strikes. The committee of ten, of which Col. E. D. Meier was chairman, appointed at the convention held in Buffalo last year, to influence the revision of the specifications and laws pertaining to marine boiler manufacturing, reported that it had discussed the matter with the inspectors at a conference held last February, and had succeeded in bringing about a number of minor changes, but that, owing to the limitations imposed by existing laws, there were many points upon which the inspectors had not authority to act. This committee was asked to continue its efforts and to arrange for a conference with representatives of Congress for the purpose of explaining the changes which seem most desirable. The laws governing the manufacture of boilers have been on the statute books a number of years and so rapidly has this industry developed in the interim, that it will be necessary to make a number of changes in the phraseology of the specifications to modernize them completely. The boiler manufacturers decided to admit representatives of supply houses to associate membership in the association, and twenty-five of those in attendance at the convention were elected as such. General James A. Dumont, general inspecting supervisor, representing the United States Treasury Department, who was invited to attend the convention, took an active part in the discussions pertaining to the present statutory provisions upon the construction and manufacture of marine boilers.

The A. Garrison Foundry Co. of Pittsburg, last week cast what is believed to be the largest plate roll ever made in a foundry in this country. The roll is 38 inches in diameter and has a face of 140 inches. It weighs 58,000 pounds. The roll is for the new plate mill that is being installed at the plant of the Lukens Iron & Steel Co., Coatesville, Pa., which will roll plates up to 134 inches in width. The roll was cast against a chill and when removed from the mold was found to be perfect in every particular.

REPAIRING A BROKEN CYLINDER.

On the night of July 11 when about three hours' run out of Buffalo, the high pressure engine of the side-wheel steamer Eastern States, owned by the Detroit & Buffalo Steamboat Co., was disabled by the breaking of the follower bolts, follower and the packing rings which jammed in the cylinder, knocking off and breaking the back head casting, the piston, and breaking the flange off the cylinder for a distance of about 7 feet, measuring around the circumference. The piston rod was bent short close to the piston. The engine of the Eastern

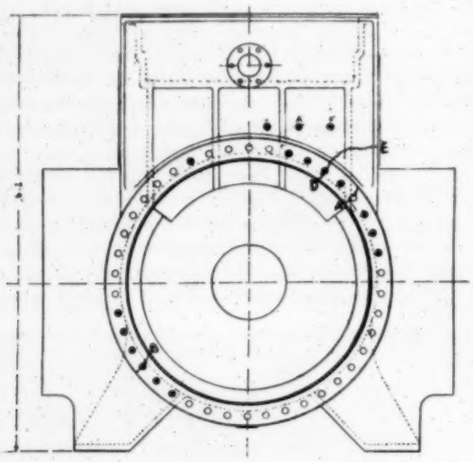


FIG. 1—A BREAK IN AN ENGINE CYLINDER.

States is of the three-cylinder ,inclined, compound type with diameter of high pressure cylinder 52 inches, and of low pressure cylinder 72 inches, each with 7-foot stroke of pistons. The boilers are worked at 140 pounds pressure and develop a horsepower of 4,000 with thirty-one revolutions. As soon as the accident occurred Mr. J. P. Wells, the chief engineer, disconnected the valve gear, shoved the valve in a position to cover part at broken end of cylinder; the open cylinder end was covered with canvas on which water was played through hose leading from the fire pump which effectually condensed any steam that passed the piston through the broken packing. Steam could not be cut off from the front end of the cylinder, owing to clearance of exhaust edges of valves. In this condition the steamer was run by the two low pressure engines to Detroit, distance 200 miles, making about 11 miles per hour with steam pressure about atmosphere.

Reaching Detroit the question of repairs was immediately

FIG. 2—BROKEN END OF CYLINDER AND FLANGE.

taken up by Mr. Frank E. Kirby, consulting engineer and designer of the steamer. It was a question of a new cylinder, requiring six or eight weeks' time in the best part of the steamer season, or repairing the broken one. After considering several plans Mr. Kirby decided to repair the cylinder on the plan known to founders as the "burning process," which was suggested by Mr. William G. Henderson, foreman of the machine shop of the Detroit Shipbuilding Co., and skillfully executed by Mr. Robert Smith, foreman of the company's foundry. The flange and part of cylinder broken off is clearly shown by the illustration from a photo, and also by the drawing of cylinder. The break extended from A to B, Fig. 1; a small crack extended about 10 inches further into the cylinder and another crack run from D to E through the flange into the port, and across the lower corner of the steam chest. The cylinder, which weighed in the rough 28,800 pounds, was removed from the steamer, taken to the foundry and placed in a pit, broken end up, and about 12 inches above the working floor. Dry sand moulds were built about the cylinder to form the flange. The burning was done in three castings on three successive days. This plan greatly reduced the risk of a break from contraction. Fusion at the line of break required from eight to ten minutes and the casting was completed in seventeen to twenty minutes. Though the broken piece weighed only 340 pounds, about six tons of metal was used in the operation of burning.

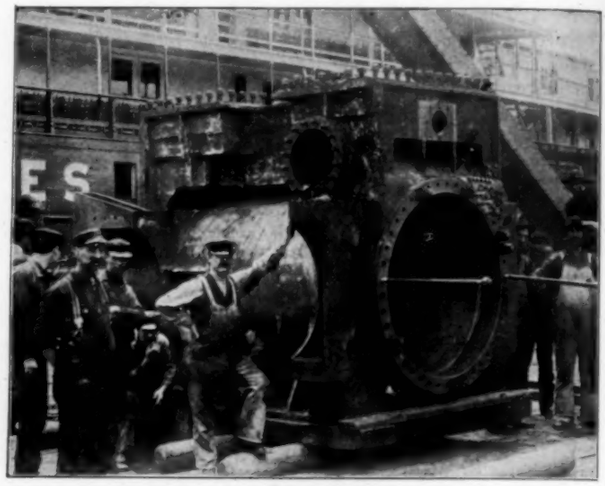


FIG. 3.—REPAIRED CYLINDER READY TO BE HOISTED INTO THE STEAMER.

After roughing out the burnt part of the cylinder in a lathe, two cuts were run through the entire length to finish the bore. A plate was tap-bolted over the small crack in bottom. The crack D E was repaired by brass plates, tap and through-bolted which show in the photo prints. The stress being relieved by collar bolts and screw stays. While the cylinder was being repaired in the manner described, a new cylinder head, piston rod, packing, follower, etc., were made and fitted. There was a slight set in the steel piston which was removed by reboring and returning.

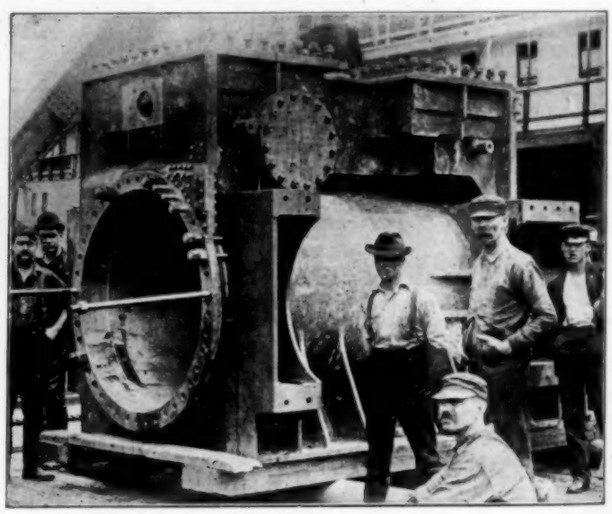


FIG. 4—ANOTHER VIEW OF THE REPAIRED CYLINDER.

On the fourteenth day after the commencement of the job the repairs were completed, a dock-trial made of the engine and the steamer was ready for service, but, owing to its being her day for leaving Detroit she did not go into service until the following day when a trial run was made at full boiler pressure. All joints were found to be tight, everything worked perfectly and she has since made her runs regularly. —[Marine Review and Marine Record.

PROPOSED RETALIATION OF WELSH WORKERS.

Vice-president Leeds, of the American Tin Plate Co., accompanied by a number of his district managers, has visited tin plate lodges of the Amalgamated Association located at Anderson and Elwood, Ind., New Kensington and New Castle, Pa., and Martins Ferry, O., during the past week, for the purpose of placing before the tin workers the proposed reduction in wages on rebate plate in its true light. As a result of these visits there has been quite a reversal of feeling on the proposition, a number of the lodges already having voted favorably. It is probable that other lodges will also reconsider their former stand on the proposition.

The following cablegram was received by the tin plate workers at New Castle, Pa., last week from workers in Wales:

"Men here protest against the contemptible meanness of the trust proposal on 25 percent reduction to collar oil plate trade. Suppose we retaliate, where would a policy of this kind lead to or end? It simply means capital prostituting labor to its own ends, as it always does. Last month we had an advance equal to 3 percent on this class of work."

Commenting on the above, George Greer, general manager of the mills of the American Tin Plate Co. at New Castle, speaks in part as follows:

"I distinctly remember that a short time prior to the attempt of capitalists, manufacturers and workmen to manufacture tin plates in the United States, the foreign manufacturers were charging the consumers of tin plate in America as high as $15.50 per box 14x20, basis 112 sheets for standard coke plates.

"At that time there was practically no protective tariff on tin plate. The exorbitant prices that were charged by the foreign manufacturers induced capitalists and workmen to embark in the manufacture of tin plates in the United States. Immediately after the works were put in operation the foreign manufacturers sent agents into this country as 'spotters,' who traced and followed shipments of plates and continuously reduced their prices until they sold as low as $4.50 per box. The price at which they sold plates was so much below the cost at which the American manufacturers and workmen could produce them that they were compelled to close down their works.

"Then they doubled their prices, and continued to maintain the high and exorbitant prices until the McKinley tariff on tin plate took effect. As soon as the American capitalists, manufacturers and workmen had commenced to build mills and operate them to supply the home trade for tin plates in the United States, the foreign manufacturers not only reduced the selling price, but reduced their labor as well, hoping thereby to still retain the American trade and prevent, if possible, the successful establishing of the tin plate business in America.

"In addition they utilized the press and had the full cooperation of a number of importers and jobbers who made it their business for months, and in fact did not discontinue the slandering and belittling of the attempt of the American capitalists and American workmen to manufacture tin plate in America; and finally, after the business had been successfully established, with the assistance of their Democratic friends, they did succeed in convincing enough congressmen, under the pretense that if the tariff was reduced they would furnish tin plate at lower prices, to reduce the tariff $1 per box, or $20 per net ton. As soon as the reduction was made they not only reduced the price the full $1 per box, but the first prices named after the tariff took effect by the foreign manufacturers was fully $1.50 per box, making a total reduction of $26 per ton, while the reduction of the tariff was but $20 per ton, which caused a temporary closing down of the American mills, and they continued to reduce the wages of their workmen and the selling price until the plates reached the lowest price at which they had ever sold.

"The reduction in price to points so far below the cost of manufacture in this country was simply done with the view of ruining if possible the manufacturers and depriving the workmen of the high rate of wages they could earn in the various departments of the tin plate mills. If that was not the 'essence of business meanness and prostituting of labor' boiled down I am very much mistaken.

"Please note that Mr. Hodge's cablegram states that less than one month ago the workmen had an advance equal to 3 per cent on the plates they furnished to America. It is quite evident that the Welsh manufacturers sell plates at a very considerable lower price to the American export trade than they do to other buyers and consumers, and the 3 per cent advance referred to 'on this class of work' means that the workmen have been given the enormous advance of a sum of less than 25 cents per turn, or day, to be divided between the hot mill workmen for one day's work.

"The impression in the cablegram referring to 'this class of work' must raise the suspicion in the mind of any careful reader that there may be a differential price on plates furnished in Great Britain for the export trade.

"Suppose for a moment we dismiss all sentiment, feeling and prejudices, and consider the facts and merits of the subject referred to, as applied to American workmen. First, two attempts have been made, one of which was successful in throwing the American workmen out of employment; second, while it did not permanently throw them out of employment it did cause a reduction in wages, and after the failure to ruin the American manufacturers and deprive the American workmen from the opportunity of earning good wages, the attempt is now made to appeal to the sentiment, prejudice and patriotism of the American workmen, with the hope that they will prefer to remain idle for a term of about two months during the year rather than secure business that really belongs to the American workmen and manufacturers and at a price fully 100 per cent in advance over the wages the hot mill men receive in Great Britain for the same class of work, including the advance of 3 per cent referred to.

"In other words, the manufacturing of the 1,500,000 boxes of export, or rebate plates, based on 100-pound plate, the net wages to the Amalgamated workmen will amount to nearly $700,000, while the wages paid to the Great Britain workmen in the hot mills department would amount to less than $350,000, or 100 per cent less than American workmen would receive for the same amount of work.

"In addition to earnings of the hot mills department, the amount that would be paid to workmen in other departments of the tin plate industry would amount to over $800,000, additional to the amount paid to the Amalgamated workmen, or a sum total of over $1,500,000. Applied to New Castle, if the business was diivided equally between 250 mills, the New Castle workmen's share would be one-fifth of the entire amount, or over $300,000 net, after having deducted the rebate asked by the American Tin Plate Company on the business referred to."

Obituary.

George Presley, secretary and treasurer of the Bassett-Presley Co., Cleveland, died Sunday, Aug. 17, from heart failure. He was 50 years of age.

John Henry, for many years identified with the sheet steel industry in the Pittsburg district, died at the Mercy hospiltal, Pittsburg, on Saturday afternoon, August 16. In order to regain his failing health, Mr. Henry left his home at Carnegie, Pa., on Friday evening to come to Pittsburg on his way to a sanitarium in Michigan. While alighting from the train at the Fourth Street station, he slipped and fell, the train passing over and completely severing one of his arms. He was immediately hurried to a hospital, but owing to his already weakened condition he was unable to surivive the terrible injuries. For nearly 40 years the deceased was identified with the iron and steel industry of Pittsburg in one capacity or another. He was born 60 years ago at Port Talbot, Wales, and in 1866 came to Pittsburg. He was employed in the capacity of roller and superintendent of various plants until 1884, when he organized the Chartiers Iron & Steel Co., at Carnegie, Pa., the first big industry located in that valley and one of the pioneer sheet steel industries of the country. He remained at the head of the company until 1900 when the American Sheet Steel Co. was formed, his plant being included in the organization of that combination. He then retired from the management of his plant but has acted in an advisory capacity for the American Sheet Steel Co. since that time. He is survived by his wife and four children.

Secretary Childress, of the Oil Exchange at Beaumont, Texas, has had an inquiry from Missouri relative to the location of a large iron blast furnace in this city.

AN IMPROVED MILLING CUTTER.

A milling cutter has been invented by B. W. M. Hanson, of the Pratt & Whitney Co., of Hartford, Conn. The invention relates to the milling cutters employed for forming various contours, the object being to provide an improved cutter having the contour of its teeth relieved at suitable intervals to permit the ready access of oil to the succeeding edges of the tool and to permit the chips to roll up more freely. The nature of the improvement is suggestive of the tap manufactured by the same company in which the successive teeth are removed, but a close examination of the patent here described will show that the matter of tooth relief is something more than a reduction of cutting edges.

A side elevation of a milling cutter embodying the present invention is illustrated in Fig. 1, the cutter being shown at work. An edge view of the cutter in section is seen in Fig. 2, the section being taken on the line 2 2, in Fig. 1. Fig. 3 is an edge view on an enlarged scale, showing a flat development of the teeth of the cutter of Figs. 1 and 2.

The inventor points out that in the use of milling cutters

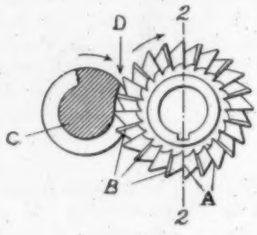


FIG. 1.

FIG. 2.

A NEW MILLING CUTTER.

for forming contours which are not in a straight line two principal difficulties are encountered: first, that of conveying a supply of oil directly to the cutting edges of the succeeding teeth as they follow each other through the cut, this difficulty being due largely to the fact that each tooth is ordinarily made of the full contour to be formed and every tooth therefore effectually stops and wipes all the oil out of the cut, thus allowing practically no oil to pass to any succeeding cut until the preceding tooth has emerged from the groove. The second difficulty is that of rolling up the chip which is carved from a contour departing to any extent from a straight line, the difficulty increasing with the angularity of the contour. These difficulties are intended to be removed by the present method of manufacturing the cutters.

The cutter, aside from the features of the present improve-

FIG. 3—A NEW MILLING CUTTER.

ment, is of a well known type, having a concentric bore and keyway by which it is mounted upon and driven by a mandril. The cutting teeth upon the circumference are of a suitable form for milling the flat bottomed V-threads. As usually made the teeth of such cutters are all of the full desired contour but in the present design portions of the tooth shapes are removed as at A, the unrelieved or cutting edges being indicated by the letter B in each case. In practice and for most purposes it is deemed advisable to relieve the same portion of alternate teeth as shown in Figs. 1 and 3. It is also preferred whenever the number of teeth and the contour will permit to provide the relief on alternately opposite sides of the succeeding teeth as shown in Fig. 3. In that case, however, the relieved portions of adjacent teeth should not overlap but rather the reverse—that is to say, the unrelieved portions of immediately adjacent teeth should overlap so that the complete contour to be formed is outlined by a small number of the neighboring teeth. In the cutter shown in the drawings the contour being simple is complete in any two adjacent teeth.

The preferred relation of the teeth of the contour shown in the drawings is best illustrated in the diagrammatic view of Fig. 3, which represents in enlarged scale a development of the teeth of the cutter in Fig. 1. The outer and inner horizontal lines in Fig. 3 represent the planes of the edge of the shape to be cut by the tool, the outer lines being the flat sides of the cutter. The unrelieved corners of the teeth are drawn in coincidence with these lines whilst the relieved sides A of the teeth are shown inside of the lines.

For convenience in the manufacture of these cutters the relieved portion is milled below the cutting contour before the cutter is hardened. The cutting faces of the teeth are shown in Fig. 1 by a double line, representing the flats that would be formed upon the cutting edges in grinding them while the relieved edges are represented by a single line.

The action of the relieved portions of the teeth in permitting the passage of the oil to the succeeding teeth and the consequent desirability of having these relieved portions on the alternately opposite sides of the succeeding teeth are best understood from Fig. 1. The direction of rotation of the screw shaft C which is being milled is indicated by the respective arrows, and the oil, which is supplied from above in the direction of the arrow D, flows into the cavity which is being milled out between the threads of the screw. If the teeth were all of the full contour each one would sweep the oil out clean along with the chip, but by relieving the alternate teeth the oil flows readily past the relieved portions of each tooth to the succeeding tooth, and by alternating these relieved portions, as shown in Fig. 3, the oil can easily flow to all the teeth in the cut sufficiently to keep the work and the cutter cool.

For convenience in forming the teeth of these cutters it is desirable to have at least one tooth, as E, carrying the full contour—that is to say, to leave one tooth entirely unrelieved, since this facilitates the grinding and gauging of the cutter and also facilitates setting or adjusting it in the desired relation to the work to be done.

News From the Foundry at Northwood.

"Down by the placid Shell Rock, just east of the mill bridge, the Northwood Foundry Co., one of our city's recently acquired industries, is doing business. The carding mill, which in the brave days of old made white and fluffy the yellow matted fleeces brought in from the farms round about, and then for the better part of two decades stood as a dreary monument of the expired glory of bygone times, has received the impulse of a new life and is resounding with the busy hum and clang of machinery and tools in contact with iron, hot or cold. The Northwood foundry is not a foundry only; it is a machine shop, a blacksmith shop and a pattern shop as well, and repairing of old things as well as making of new is carried on. The building has a basement and two stories. In the basement is the boiler of 10 horsepower that furnishes the energy for the establishment; also the base of the cupola which rises 30 feet high and is the furnace in which the iron is melted and sent into the molds in the molding room, which is also situated in the basement. A coal and coke room are located here, too, and take up the balance of the space. On the main floor the visitor first enters the blacksmithing department, thoroughly equipped with all needful implements, and from there passes into the machine shop. This branch of the institution contains the 7-horsepower engine that drives the massive and ingenious machinery. First among this a large planer attracts attention. It will plane iron as easily and as smoothly as a carpenter planes a board and is a tool of great utility in a foundry. Next comes a turning lathe, an implement of vast proportions and of vaster intricacy to the uninitiated, which performs divers and sundry miracles in iron that the writer dare not specify for fear he might be accused of exaggeration."—[The Northwood (Ia.) *Index*.

The machinists employed by the Hydraulic Machine Co., Pittsburg, have gone on a strike owing to a refusal to recognize their union. Some time ago the men made a demand for an increase of 10 percent in their wages, or failing in this an advance of 5 percent with recognition of their union. The company conceded an advance of 5 percent but deferred recognition of the union for one year.

Recent Blast Furnace Practice.*

BY BRIERLEY DENHAM HEALEY.

(Concluded from Aug. 14.)

Blowing Engines.

A great many furnaces are still blown by engines of the very oldest type, running at from 16 to 20 strokes per minute, and with a maximum air pressure of 5 pounds per square inch. A few of the most modern furnaces are working with a normal pressure of 10 pounds per square inch, and their output exceeds 1,500 tons per week, as against the old average of 426 tons. Steam driven blowing engines for this work have now reached immense proportions, and the speed of the largest steam engine has gone up to 50 revolutions per minute. The air cylinders at some of the older works are 12 feet diameter, whilst 9 feet diameter is a common dimension for modern blowing plants.

A new departure in blowing has been made recently by using the otherwise waste gases of the blast furnaces for obtaining the blast pressure. The Thwaite-Gardner system of treating blast-furnace gases and using them for driving internal-combustion engines appears to offer the greatest advantages in this direction. The blowing cylinder is erected vertically over a central crank, and the gas engines are placed to the right and

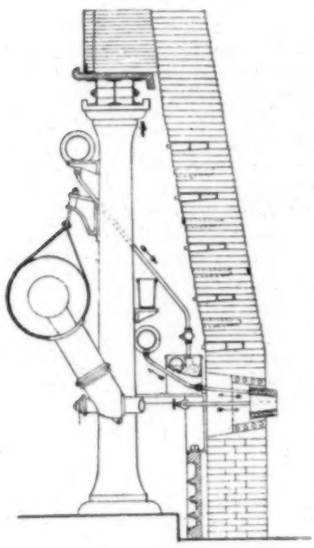


FIG. 18.

left, and work horizontally. A set of these engines has been erected at the Clay Cross Iron Works, Derbyshire. Their maximum speed is 150 revolutions per minute, and they develop over 500 indicated horsepower. The gas used may be taken at less than a quarter of the quantity formerly consumed for obtaining the same volume of blast, and the equivalent power developed. The exact volume of gas used can be ascertained very readily at any time by simply measuring the fall of the gas-holder and counting the engine strokes, say for five minutes. By taking indicator cards during the same interval, the gas used per horsepower is easily calculated.

The enormous value of furnace gas when used in gas engines will be more fully recognized when dealing with poor gas, which will not burn in the boilers without the assistance of solid fuel. The author has often stated that such gas is quite strong enough for direct combustion in suitably designed gas engines, and the correctness of this statement was quite recently proved at the Clay Cross Works. It is well known that, from a variety of causes, the gas varies considerably, even when taken from furnaces which are working pretty regularly upon the same charge, and the following practical illustration cannot be refuted. During the night, just about three months ago, the gas at the Clay Cross Works was so poor that the steam supply gave out, and it was impossible to obtain the usual blast. The gas blowing engines were then started, and without any difficulty kept on, until the steam was at the normal pressure.

The gas from a 1,500-ton-per-week furnace, working on coke, after allowing, say, one-third for heating the blast, 900 indicated horsepower for gas driven blowing engines, and 100 indicated horsepower for furnace charging, pumping water, and clearing away the slag, leaves a surplus of 5,000 indicated horsepower for electrical energy generation or other power purposes. This would be sufficient to drive the whole of the machinery of an adjoining steel-rolling mill of equivalent capacity to the blast furnace output, and also provide for lighting the works, offices and workshops. From the author's calculations it may be fairly assumed that 6 indicated horsepower per hour are obtainable for every ton of iron produced per week in coke-fed furnaces. From the total power thus ascertained provision has to be made for heating and compressing the blast, and for working the plant, as already shown in the 1,500-ton example.

A new system of blowing engine was patented some five years ago by B. H. Thwaite. This consists of a series of two, three, four, or more rotating blowers or fans. The first fan, developing, say, 2 pounds pressure at its outlet, has its pressure increased to 4 pounds by the second fan, and the progression is in a similar ratio at the outlets of the other fans. This rotating system may in the near future become a rival to reciprocating motion, just as certainly as the turbine may supersede screws for the propulsion of steamers.

Power Generators.

Up to the present time steam boilers of every variety in form and length have been used for generating power; and, unfortunately, in a vast number of cases they have been the

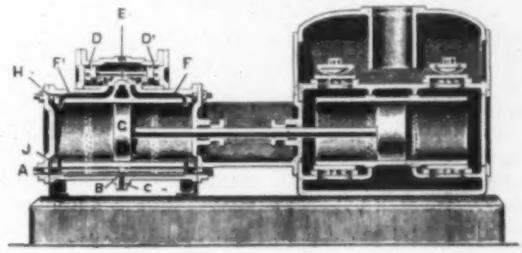


FIG. 19.

greatest cause of anxiety to managers. The majority of boilers hitherto used have been worked at comparatively low pressures; but a great number of boilers are now working at pressures of from 100 pounds to 120 pounds per square inch. The increase in steam pressures has not reduced the risk which is inseparably connected with boilers at all times, and an arrangement for superseding steam boilers by a gas-treatment plant having no risks whatever should be welcomed at every works where gas can be used.

In the Thwaite-Gardner treatment plant for gas-power engines the gas is drawn from the furnace siphons by means of a fan which is placed between the condensers and scrubbers. The gas first enters a series of washers, where the greater part of the dust is deposited, passing thence through the condensers to the coke and the sawdust scrubbers, and from the latter to the holder. The gases are then absolutely free from dust, and can be used without the slightest risk of injury to any of the working parts of engines. This is of the greatest importance in any plant designed to use furnace gases. By an ingenious arrangement, the gas-holder causes part of the gas to be churned several times through the fan, and the latter is at once an exhauster and propeller. The whole process is practically independent of any continuous water supply, which is a very considerable advantage as compared with steam boilers.

At the present time an old iron works in South Staffordshire is being entirely dismantled, and it is intended to rebuild it on modern lines generally. A very special feature will be the absence of steam boilers and the use of the power obtainable from the blast-furnace gas. This plant will be supplied with electric motors wherever power is required, and a very large surplus of electrical current will be available for elec-

*Paper read before the Society of Engineers (England), May, 1902.

trical welding and motors generally at other establishments.

Tuyere and Bosh Cooling.

In former times the tuyeres of the blast furnace were formed of coils of pipes enclosed in a cast iron casing. At first the pipes were ½-inch bore, but the size was afterwards increased to ¾-inch, and still later 1-inch pipes became the standard size. The tuyeres were, and are still, supplied with water of various degrees of purity, and at pressures ranging from 10 pounds to 30 pounds per square inch. Owing to various inherent difficulties, and to others caused by irregular internal working of the furnaces, the average cost for tuyeres is generally a large one. In addition to the cost of tuyeres lost in working, many serious explosions have occurred owing to the water from defective tuyeres making its way into the hearth of

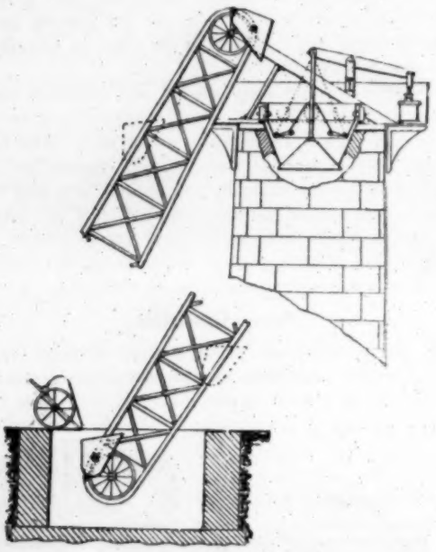


FIG. 20.

the furnace; and although the greatest care may be taken to prevent accidents, the fact remains that under the pressure system there is always danger.

The latest departure in connection with tuyeres is the Foster vacuum system, which is illustrated at Fig. 18. This system has been at work for over 12 months at Darlaston Green furnaces. The water is drawn through the tuyeres, instead of having to be forced through, and if a tuyere is burnt the water does not get into the hearth. In addition to this, each tuyere is fitted with an electrical tell-tale, and as soon as the vacuum begins to fall a bell is sounded, and the number of the defective tuyere is indicated.

The vacuum is started and maintained by the pump illustrated at Fig. 19. To start the pump from the position shown, a pilot spindle A is pushed towards the right hand; the central collar B then opens the draining port C to the left-hand chamber D of the slide valve E. Then the live steam in right-hand chamber D^1 forces the slide valve E to the left, and thereby opens the port F, thus admitting steam to the right end of the cylinder, and causing the piston G to move to the left of the position shown. As the piston G approaches the left-hand cover of the steam cylinder it closes the port F^1 and begins to slow down, as the steam thereby cushioned can only escape through the by-pass H, and at the same time the piston moves the pilot arm J to the left, and thereby puts the right-hand chamber D^1 in connection with the draining port C, and the return stroke then proceeds in the same way.

In many places a siphon may be relied on for starting a vacuum, although the water may have to be pumped up again in the service tank. A small tank, which it fitted with a ball valve, is fed from the usual overhead pressure main. Two tuyeres may be supplied from each tank, and the suction main is fixed a little higher than the tanks.

The water-cooled bosh plates which have been applied to some of the modern furnaces have lengthened the life of the linings to four times the equivalent of the former tonnage. These bosh plates are of iron, copper, or bronze, built in courses in the bosh walls every 12 inches or so in height, and the water gravitates from one course to another.

Stock of Minerals and Fuel.

The ancient methods of unloading stock and moving it about the stockyard may still be seen in operation in some of the oldest works, but such a sight fills one with wonder, considering at what trifling outlay a few pence per ton could be saved on the gross inwards tonnage. In the stockyards of modern works very capacious bins are provided for the different kinds of material, into which the wagons on overhead ways deliver their loads through drop doors. At some of the more recent works loading into the charging buckets is facilitated by having chutes down which the material is very easily drawn forward.

At works where a maximum output is aimed at, grab-buckets are used for loading up the stock, and this is absolutely necessary to get through the work, owing to the increased digestive capacity of the monster which has then to be fed. At each end of the main roads weighbridges are provided, so as to weigh the gross of every wagon as it passes inwards, and take the tare as it passes outwards. Smaller weighbridges are necesary for weighing the charges to the furnaces, or the hoisting apparatus may be fitted up with automatic weight-registration machines.

Furnace-Charging Apparatus.

Up to within quite recently it has been the practice to have one incline or hoist for delivering the stock to as many as four furnaces; but this old method has latterly been superseded. Some modern plants have a special hoist for each furnace, which takes the charges from the stockyard and delivers them automatically into the bell of the furnace. Under the old system there was a considerable amount of work to do on the upper stage, a great part of which is saved by the single direct charging apparatus. The method of dealing with the stock at the yard level under better supervision has also advantages, which may or may not outweigh a good top platform arrangement.

When the buckets or wagons are filled on the latest system, they are not only hoisted and delivered, but the bell top is so arranged that the material is distributed, and this assists in the more regular working of the furnace. A simple form of hydraulic ram, fitted up with differential-speed sheaves and steel wire rope, would appear to be a very reliable type of driver; but in any truly modern plant where the gas is fully utilized and electrical energy is generated the hoist of the future will be driven by electric motors, as it is already at some of the German furnaces.

After a careful examination of various appliances, backed

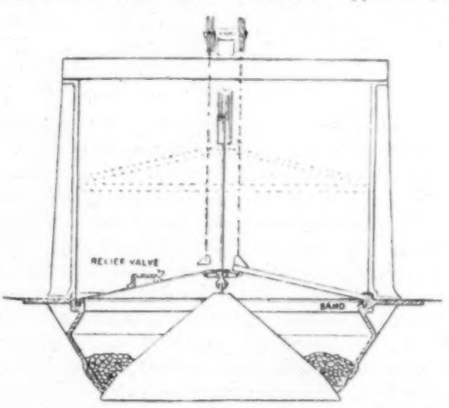


FIG. 21.

by his experience with continuous elevators, which are giving complete satisfaction, the author has designed and patented a furnace hoist fitted up with somewhat similar gearing, but with essentially different details of construction. This hoist and charging hopper, which is applicable to existing furnaces, is shown in Fig. 20. There are only two buckets at equal distances apart, so that they balance each other, and these are carried by steel pitch chains, which work upon a pair of sprocket wheels at each end of the boom framing. The top and bottom members of the framing are employed as rails for the bucket wheels to run upon. The buckets are loaded as they pass up-

wards, and at about the same time that one is being loaded the other is passing over the head gear, and is discharging its contents into the top receiving boxes.

Above the usual bell of the furnace there is a receiver consisting of six boxes, with a bottom door to each, the filling of five of which completes the usual stock charge; but the six boxes are always filled before the material is allowed to drop upon the bell. It therefore follows that as the sixth box takes the first part of another charge, the receiver distributes 1⅙ of a charge every time it is emptied, and the material will be charged into the furnace in a remarkably regular manner. The hoisting chain also actuates another endless chain, by which the charging hopper is moved 60 degrees after the discharge of each bucket; so that the whole system becomes an automatic feeder and distributor, which may be readily applied to existing furnaces. The lowering of the bell takes place after closing the flap doors, so that there is a very small loss of gas and no escape of flame.

Single direct-feeding hoists might with advantage be fitted with indicating gear so as to record the time of sending up every charge. This would be a check on the charge-man, and it would be impossible for the burden to fall too low without the time being told by a tell-tale, which is a checker that most men generally respect.

Some device of a thoroughly reliable character is absolutely necessary to prevent overwinding in all hoists of this description, as any hitch with the hoisting gear causes great inconvenience, and may upset the proper working of the furnace, especially where there is no platform for connecting the fur-

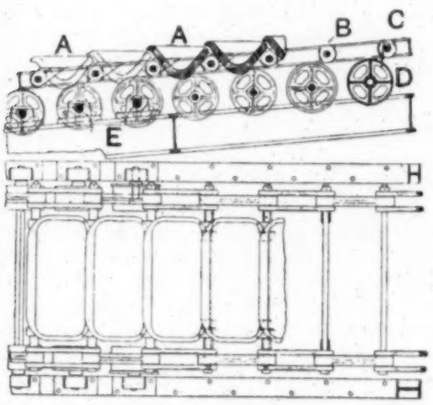


FIG. 22.

naces. A very effective arrangement of bell-top, which can be readily adapted to existing furnaces, has been designed by B. H. Thwaite, and is illustrated by Fig. 21. The usual hopper is provided with a cover, which is made in four parts, and the usual bell and this cover can be so operated as to prevent the outflow of gas or the inflow of air.

Pig Bed for Iron Output.

The old-established practice of molding on pig beds is still commonly followed, and for an output not exceeding 700 tons per week it will doubtless continue in use. Those works which run a large proportion of the metal direct into pipes and other castings, and into mixers for steel making, should always have a pig bed for emergency requirements. However, for a tonnage exceeding 700 tons per week, some form of casting machine should be adopted for dealing with such an increased output of iron. The Uehling casting machine, or the apparatus designed by Mr. Hawdon, appear to meet the principal requirements of a modern plant, and their use effects a considerable reduction in the wages bill.

The casting machine invented by Mr. Hawdon, of Middlesbrough, has been selected by the author as the most simple and reliable apparatus, and it is illustrated by Figs. 22 and 23. The molten iron is poured from a ladle into spouts, in which it flows to the moulds, and the latter are slowly carried upon inclined endless chains which are timed to allow the metal to set before the pigs are delivered from a chute to a circular conveyor. The circular conveyor rotates in an annular trough of water, necessary for the final cooling of the pigs, and upon arrival at a fixed plough bar the pigs are thrust on to an elevator, the bars of which carry them to the top and shoot them into railway trucks. All the working parts of this machine can be lubricated, and the bearings are some distance from the moulds, so that the heat radiating from the apparatus in work is somewhat dissipated, and the bearings remain comparatively cool.

Wherever the output is 100 tons or more per day some form of pig-breaker should be adopted, and it should deliver the

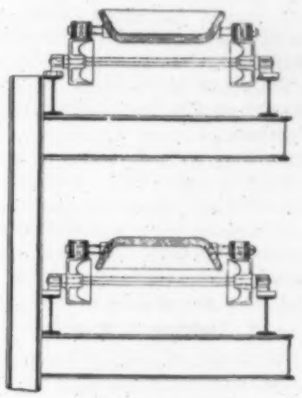


FIG. 23.

broken pigs to an elevator, to be discharged into railway wagons ready for dispatch. The pigs are lifted from the pig bed in batches by an overhead crane and taken to the pig-breaker table at a cost of 1½d. per ton, as against 6d. per ton, as previously paid.

Slag Removal and Disposal.

In many of the oldest works the slag is allowed to run into tapered fixed cast iron molds, which are formed with a lifter in the center of each. The iron lifting piece, being well coated with loam, is easily driven out of the congealed lump of slag after it is placed on the trolley which is to convey it to the tip, and it is capable of use for a considerable period. In other works slag cars are used with rectangular boxes which have folding sides, and these can be drawn away from the slag at the proper time, and so allow the bottom frame of the bogie to carry the lump to the tip.

At other places the slag boxes have conical sides with considerable taper, to permit of their being lifted from the bottom of the cars, which is generally done by a steam crane when the slag has set. This form of slag box is built up in sections, which are held together by strong wrought iron bands, and the continual change of temperature has very little effect upon its durability.

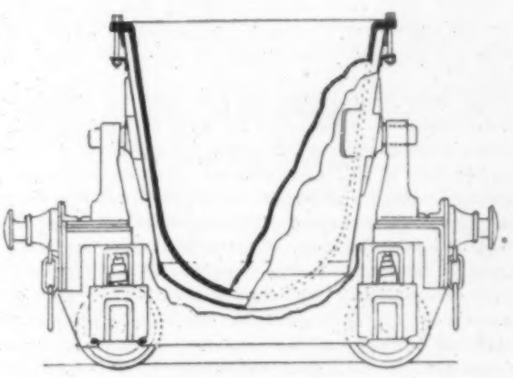


FIG. 24.

A considerable quantity of slag is now used for making paving blacks and cement. The basic slag is selected and pulverized for sale to farmers, and the slag-wool trade and the slag-gravel trade are now taking a very large quantity. Last, but not least, the works bordering on our tidal rivers have been the means of causing great improvements to be made by

tipping large banks of slag for the purpose of narrowing and consequently of deepening the streams.

For all high tonnage blast furnaces it is necessary to deal with the disposal of the slag in a very thorough manner in order to reduce the cost. With this end in view a special form of cast iron ladle has been introduced into practice by Messrs. Stevenson & Evans, a large number being in use. It consists of a cast iron ladle carried in a plated casing, and is illustrated in Fig. 24. The slag leaves the ladle quite freely, whether it has set hard or remains molten. Two ladles, each of 10 tons capacity, are generally found sufficient for a 700-ton-per-week furnace.

Another form of slag ladle, the invention of Mr. John Dewhurst, of Sheffield, is also largely in use. The working cost of these different designs of ladles has so far been found to be very nearly the same, so that their choice depends mainly upon the views of the user.

The most expeditious method of dealing with blast-furnace slag is to run it into a well which is partly filled with water. The slag is granulated as it comes into contact with the water, and it is then dredged up and loaded into trucks by elevators. This is an up-to-date American system and requires less labor and space than any other, and there should be no difficulty in finding a market for a considerable quantity of such material.

Lighting of Works.

Generally the systematic lighting of smelting works has not been anything like what it should have been, the customary flare from the furnaces by night, and a few common lamps, being accepted as sufficient. In a few places gas lamps have been used, somewhat as a luxury, but of recent years such a great advance has been made with electricity as a lighting agent, that even the masters of smelting works have fallen into line with others, and have adopted this system. Additional light is absolutely necessary in any works where a maximum output is aimed at, and it can be obtained almost for the asking by using a very small part of the otherwise waste gases of the blast furnace for internal-combustion engines, which are now available on the Thwaite-Gardner system, and which are specially adapted for continuous running for power and electric lighting installations.

Repair Shops and Laboratory.

Every smelting works is not of sufficient extent to require a fitting or a repairing shop, but they at least require a good smithy and carpenter's shop, and these should be spacious and situated at a convenient distance from the furnaces. Where the works are of sufficient size, it is an economic policy to provide repairing and fitting shops, and to keep spare parts for renewal of things that are liable to great wear and tear or sudden collapse. At many smelting works, where a considerable quantity of machine work is done, machines are still in use which should long ago have been on the scrap-heap, and at some of these works good modern-made machines are seldom found. It is of the greatest importance to the proprietors that they should adopt labor-saving machines, and be in a position to do any kind of work usually undertaken, quite as expeditiously and as cheaply as any of the up-to-date firms in the trade.

In the order of this paper the last item—the chemical laboratory—is by no means that of least importance. On the contrary, a good and regular system of analysing all mineral, flux, and fuel is absolutely essential in every works of any magnitude. Upon the results obtained by analysis the contracts for stock are made, and the quality of the supply is kept up by constantly checking the material as it is delivered. In the smaller works the manager is generally an efficient chemist, and things usually work very smoothly where such an arrangement exists. In larger works these duties are performed by different officials, and the laboratory is invariably ruled by the manager. In the largest works one or more assistants are required in the laboratory, besides ordinary labor for assisting in the preparation of the samples.

General Observations.

It is now recognized that an increase in the size of the furnace hearth provides space for extra tuyeres, which in a high-tonnage furnace is absolutely necessary for a proper distribution of the necessary weight of air.

The blowing engines, blast mains, and heating stoves should be of sufficient strength for such an increase of pressure as will force its way through any "block" which is likely to occur in the furnace, although the steady delivery of the volume of blast at the normal working pressure is the main thing to aim at.

Reducing the size of the tuyeres to obtain a greater pressure has been tried, as an experiment, and it resulted in failure. The engines had more work thrown on them than they were designed to carry, and the result was actually a less volume of blast and a reduced output from the furnace.

The normal working pressure of blast must suit the nature of the minerals and fuel used, and consequently the height of the furnace and its capacity, all of which require to be carefully considered when laying down the interior lines of a blast furnace.

In order to increase the output of a substantially built existing plant, generally an extra weight of blast, together with a slight alteration of the furnace crucible and tuyeres, may be relied upon to effect the object desired, and this can be obtained most readily and economically by the addition of gas-driven blowing engines.

Unless the single direct-charging apparatus is thoroughly reliable, it is far better to continue the use of barrows, along with separate hoists for all high-tonnage furnaces, retaining the upper platform as it is now, and when one hoist requires repair its work may be divided between the hoist on either hand.

Results of a Gas Engine Test.

The following are the results of some tests of a 100-h. p. blast furnace gas engine at the Sheepbridge Iron Works near Chesterfield, constructed by the Blast Furnace Power Syndicate, Ltd. Mr. Albutt and Mr. Mason represented the Sheepbridge Co., and Mr. Horace Allen had charge of the tests on behalf of the syndicate. The engine is of the single cylinder Otto cycle type; cylinder 22 inches diameter, stroke 30 inches, connected with leather link belt 14 inches wide by 7/8 inch thick to dynamo. Direct current dynamo, 230 volts, 300 amperes, 500 revolutions per minute. The electrical current provides power for the pipe foundry, including one large Root's blower, one Sturtevant fan, one traveling crane, one turntable motor, one sand mill, and the lighting of the works.

A pressure governor holder, 12 feet diameter, with 8-foot lift, was used for measuring the gas. The area being 113 square feet, 1 foot of fall is equal to 113 cubic feet. The engine runs day and night except on Sundays, and the load is very variable. The gas washer is cleaned every week-end.

The tests were made on two different dates, viz.: December 7 and 14, 1901.

	December 7th.	December 14th.
Furnaces in blast	One	Four
Fuel used in furnaces	Coal 1.45 Gas coke 1.00 Hard coke 1.00	1.45 1.00 1.00
Mineral used	Mixed	Mixed
Iron produced	Foundry and forge	Foundry and forge
Temp'ture of gas entering washer	241° F.	227° F.
Temp'ture of gas enter'g condenser	103	73
Temp'ture of gas leaving condenser	68	41
Temp'ture of gas washer water	102	99
Temp'ture inside engine house	65	67
Temp'ture outside engine house	57	37
Temp'ture of water in cooling tank	70	88
Temp'ture of gas in holder	52	40
Volume of water in cooling tank	2,300 gals.	3,790 gals.

VOLUMETRIC ANALYSIS OF GAS IN HOLDER DURING TESTS.

	December 7th.	December 14th.
Carbonic acid (CO_2)	8.3	7.8
Carbonic oxide (CO)	26.5	22.4
Oxygen (O)	1.2	2.2
Hydrogen (H)	5.0	3.8
Marsh gas (CH_4)	0.4	0.8
Nitrogen (N)	58.6	63.0
	100.0	100.0
	B T U.	B T U.
Thermal value per cubic foot at 60° Fah.	Higher 106.0 Lower 102.2	Higher 93.3 Lower 89.4
Coke and sawdust scrubbers	Worked 16 days	Worked 23 days
Pressure of gas at fan outlet	2.50 in. water	2.50 in. water
Pressure of gas at holder	8.75 in. water	1.375 in. water

FROM INDICATOR CARDS.

	December 7th.	December 14th.
Maximum pressure per square inch	208 lbs.	199 lbs.
Compression per square inch	116 "	110 "
Mean effective pressur per sq. inch	55 "	51 "
Revolutions of engine per minute	150.0	54 0
Ignitions during tests per minute	55 6	66.4
Ignitions possible per minute	75 0	77.0
Ratio of load per cent.	74 0	86.2
Average indicated horse-power	84.8	97.5

N. B.—The charge was reduced to give high ratio of ignitions.

	December 7th.	December 14th.
Volts	230	230
Amperes	160	200
Kilowatts	36.8	46.0
Electrical horse power	49.3	61.6
Efficiency indicated horse power per cent to electrical horse power, including all losses	58 0	63.1
Volume of gas per explosion	3.16 cub. ft.	2.64 cub. ft.
Volume of gas per hour	10,558.00 "	10,516.00 "
Volume of gas per electrical horse-power per hour	214.10 "	170.80 "
Volume of gas per indicated horse-power per hour	125.40 "	108.00 "
B.T.U. per electrical horse power per hour	21,881	12,487
B.T.U. per indicated horse-power per hour	12,816	9,655
Thermal efficiency electrical horse power, including all losses	11.6 per cent	20.4 per cent
Thermal efficiency indicated horse power, including all losses	19 8 "	26.3 "

This table of results has been compiled from information supplied by Mr. Horace Allen, C. E.

Colorado Fuel & Iron Co.'s Statement.

The statement of earnings and expenses of the Colorado Fuel & Iron Co. for the eleven months ended May 31, is as follows:

	Gross.	Expenses.	Net.
Fuel department	$6,056,256	$5,176,785	$879,470
Iron department	6,213,423	5,448,635	764,787
Denver retail department	291,053	264,358	26,695
Miscellaneous	1,811	.....	1,811
Total	$12,562,544	$10,889,779	$1,672,765
Less management			182,772
Net carried to income account			$1,489,993

The condensed balance sheet, as of May 31, 1902, follows:

ASSETS.

Real estate	$17,272,793
Equipment, fuel department	5,414,352
Equipment, iron department	13,801,557
Equipment, miscellaneous	98,740
Equipment, sociological	5,712
Hospital department	250,662
Coal mine development	135,535
Royalties on leased lines paid in advance	59,298
Sociological expense	16,530
Bond premium	21,296
Cash and convertible assets (as per statement)	8,875,023
Total	$45,951,503

LIABILITIES.

Capital stock, preferred	$ 2,000,000
Capital stock, common	23,000,000
Col. F. Co. gen. mtg. 6% bonds	724,000
Col. Fuel & Iron Co. 5% bonds	5,271,000
Col. F. & I. Co. deb. 5% bonds	10,000,000
Funded for payment of taxes	35,000
Fund for payment of personal injury	22,856
Fund for payment of fire insurance	37,704
Fund for relining furnaces	111,175
Fund for emergencies	82,125
Sink. fund Fuel department equipment	707,879
Sink. fund Iron department equipment	452,700
Sinking fund real estate	317,814
Sink. and other funds for 11 mos. (est.)	285,059
Cash liabilities (as per statement)	1,964,870
Profit and loss (surplus)	939,257
Total	$45,951,503

The report that the association of shovel manufacturers had dissolved and that prices have been cut is without foundation of fact.

INTERNATIONAL HARVESTER CO. ORGANIZED.

The International Harvester Co. has been organized under the laws of New Jersey with a capital stock of $120,000,000, to manufacture and sell harvesting machinery. It has purchased the property and business of the following manufacturers: The McCormick Harvesting Machine Co., Deering Harvesting Co., Plano Manufacturing Co., Warder, Bushnell, Glessner & Co. (Champion), Milwaukee Harvesting Machine Co.

The officers of the company are as follows: President, Cyrus H. McCormick; chairman executive committee, Charles Deering; chairman finance committee, George W. Perkins; vice presidents, Harold F. McCormick, James Deering, William H. Jones, John J. Glessner; secretary and treasurer, Richard F. Howe; board of directors, Cyrus Bentley, Paul D. Cravath, William Deering, Charles Deering, James Deering, E. H. Gary, John J. Glessner, Richard F. Howe, Abram M. Hyatt, William H. Jones, Cyrus H. McCormick, Harold F. McCormick, Stanley McCormick, Eldridge M. Fowler, George W. Perkins, Norman B. Ream, Charles Steele and Leslie D. Ward.

The incorporators have issued a statement in which they say: "The company is capitalized on an exceptionally conservative basis. Of its assets, $80,000,000 are in cash working capital. The company will require no financing and there will be no offer of its stock to the public." After alluding to the advance in prices of raw material and the possible consequent advance in the price of harvesting machinery, unless changes in conditions of manufacture could be accomplished, the statement continues: "The manufacturers realize that their welfare and the interests of the farmers are identical. An advance in the price of agricultural machinery would injure the farmers and react upon the manufacturers. But on the other hand, if existing conditions continued an advance in prices would be inevitable. It thus became necessary that either the prices should be advanced or that substantial economies should be effected in the manufacture and distribution of agricultural machinery. The management of the company will be in charge of gentlemen who have for years been identified with the business. The company will start with ample manufacturing facilities. It has five fully equipped manufacturing plants in the United States and one plant in process of construction in Canada."

President George W. Crouse, of Aultman, Miller & Co., Akron, O., says that that company will probably join the combination.

Lake Superior Mining Institute.

The annual meeting of the Lake Superior Mining Institute is now being held. Points of interest about the city of Duluth were visited Tuesday and an informal reception was held. Late at night the members left on a special train for Hibbing, arriving in that city early next morning. Visits to the ranges will cover the time up to Friday afternoon, when the party will return to Duluth, where a number of papers will be read, including the following: "A New Changing-house at West Vulcan Mine," by William Kelly; "Use of Steel in Lining Mine Shafts," by Frank Drake; "Moisture in Lake Superior Iron Ores," by Dr. N. P. Hulst; "Nordberg Air Compressor at the Burra Burra Mine of the Tennessee Copper Co.," by J. Parke Channing.

It is estimated that $15,000,000 worth of machinery will be required for the isthmian canal. Aside from dredging machinery, electric light plants must be established, air pressure plants will be demanded, also a vast amount of steel will be required. The National Association of Manufacturers, realizing that millions of dollars are to be expended by the government, has issued a circular. It calls attention to the early beginning of the work and explains in a general way what will be needed.

Members of the United States Steel Corporation underwriting syndicate have received a third dividend of 5 percent on the face of the $200,000,000 for which they were liable. The syndicate did not advance more than 12½ percent of this amount, however, so its profits to date are $30,000,000 on the actual outlay of $25,000,000.

Strength of White Iron Castings as Influenced by Heat Treatment.*

BY A. E. OUTERBRIDGE, JR.

In the year 1882 while engaged in metallurgical work at the car wheel foundry of A. Whitney & Sons in Philadelphia, my attention was called by the inspector of wheels to an unusual and remarkable change that had occurred in the chilled or white iron forming the "treads" of a number of wheels poured from one heat. This change was first observed on removing the wheels from the annealing ovens. It was customary for the inspector to prove the hardness of the chilled treads by testing them with a cold chisel all around the "throat," or place where the tread joins the flange. On this occasion he found a number of wheels which were quite soft on one portion of the rim, extending the entire width of the tread for a length of 6 or 7 inches, while on either side of the soft spots the chilled tread was so hard that the steel chisel slipped over the surface without biting. In order to study the nature of this singular occurrence I caused the wheels to be broken through the soft spots, so as to examine the fracture, and I found that the white iron (chilled iron) had been changed into perfectly gray iron, evidently after the wheels had been cast. The change was not equally well marked in all of the wheels, and the soft spots were smaller in area in some cases than in others; but in all the dividing line between the white portion and the gray portion of the chilled tread was sharply defined.

It is perhaps necessary to state that in the establishment where these wheels were cast, it was customary to pre-heat the annealing pits by means of soft coal fires before the wheels were lowered into them, the flames passing through the pits or ovens. The rule was to close the dampers just before the pits were opened to receive the red hot wheels, in order to shut out the flames. After careful investigation, I found that through an oversight, the dampers of the annealing pits had not been closed and the flames from the fires impinged upon the surfaces of three or four red hot wheels in the lower part of each pit, causing a complete change of the carbon whom the combined form to the free condition wherever the flames touched the castings.

Drillings were taken for analysis from the soft parts of the chilled treads and also from other parts of the wheels, as well as from test pieces poured from the same ladles of iron. The analyses showed two things—first, that the car wheel iron was of normal composition; second, that the only change in the metal of the annealed or soft portion of the "chill" was in the condition of the carbon, which had been converted from chemical combination with the iron into an amorphorus form of graphitic carbon, or, to speak more guardedly, I would prefer to say simply into the form of "free" carbon, for there are reasons for believing that the carbon in this case is not in the same condition as when it exists normally in gray iron.†

Specific gravity tests showed that the gray cast iron resulting from this accidental heat treatment of white iron differed materially in density from the normal gray iron forming the unchilled parts of the same castings. The specific gravity was about 7.80 as compared with specific gravity of about 7.20 for the normal gray metal. A cubic foot of the gray iron produced by this annealing process, therefore, weighed about 37.5 pounds more than a cubic foot of the normal gray iron of the same casting. It was noticed that the fracture was of much finer grain than normal gray iron, and "chips" or drillings of the annealed chilled iron differed greatly in appearance, size and shape, from the chips or drillings of the normal gray iron made with the same drill.

Several metallurgists to whom the pieces of annealed chilled iron were exhibited offered a plausible explanation of the phenomenon, saying that it was merely an accidental conversion of the white iron into malleable iron and therefore presented no novel features. The analyses quickly showed the fallacy of this theory, for the total carbon was the same after annealing as before annealing, being about 3½ percent in each case, while in the ordinary conversion of white iron castings into malleable iron, a large part of the carbon is removed by the oxidizing material in which the castings are imbedded when subjected to heat treatment, and this conversion of white iron into malleable iron can only be successfully accomplished on sections of metal of moderate thickness, say less than 3 inches.

Converting White Castings into "Steel."

Although this accidental discovery of annealing of white iron on the treads of car wheels was regarded as an interesting and novel one at the time, the only practical use made of it was to guard against a repetition of the accident in the annealing pits of the car wheel works with which I was at that time connected. After the lapse of several years I was called upon to investigate in a professional capacity, and in the interest of some prospective investors, the merits of a new process of converting white iron castings into steel and received from the manufacturer a number of axes, hatchets, and other edge tools, which had been cast in white iron and subsequently converted into a metal having evidently many of the qualities of steel.

Without describing in detail the process to which these white iron castings had been subjected, I may say briefly that they were placed in the muffle of a furnace together with a chemical compound claimed to be necessary to the conversion of the cast iron into steel. Common salt and crude hydrochloric acid were two ingredients of this compound. The similarity between this process and the accidental over-annealing of the car wheel (with consequent change of the condition of the carbon) suggested to my mind that the chemical compound was probably unnecessary and that the secret consisted solely in the heat treatment, and I so advised my clients.

The conversion of white iron castings into dense gray iron having high tensile strength (approximating that of certain grades of steel) capable of being hardened and of taking a sharp cutting edge, is no longer a secret and is carried out on a commercial scale in a number of establishments. While I cannot speak positively, I am of the opinion that the heat treatment alone is now relied upon to produce the desired results. These products are not steel castings, though sold in some instances under the name of steel; neither are they malleable iron, but they may be described as occupying a peculiar position midway between cast steel and cast iron.

Differences in White Iron Castings.

Having given a resume of the history of this process of heat treatment of white iron castings, I will state a few facts regarding certain interesting features, including tensile strength of this converted metal. In the early experiments I found that there was a vast difference in white irons. Some samples remained white and hard after having been soaked for many days in the annealing furnace, even when subjected to the highest temperature below the melting point of the metal, while other specimens of white iron of the same dimensions yielded readily to the heat treatment and became completely converted into gray iron in a few hours at a comparatively low temperature, analyses of the different samples revealed the chief cause of this difference. It depends almost entirely upon the presence or absence of silicon in the white iron castings containing only a trace (or a few tenths of 1 percent) of silicon cannot be successfully treated, for only a partial change of the combined carbon into free carbon takes place, even after prolonged treatment at the highest temperatures. Thus, in one of my tests two white iron bars about 2 inches in diameter and 12 inches long were placed side by side in the furnace and subjected to the heat treatment for eight hours. One of the bars containing about 0.15 percent silicon, was cast in sand; the other, containing 1.25 percent silicon was cast in a heavy iron mold, because, if cast in sand it would not have been white iron. Both bars were equally brittle, equally hard, and perfectly white before treatment. A slight tap with a hand hammer was sufficient to break them. When removed from the

* Read at the Atlantic City meeting (June, 1902) of the American Society for Testing Materials.

† "Through purely chemical methods four conditions have been detected: 1. Graphite or free crystallized carbon, not acted on by acids even when concentrated. 2. Graphitic carbon or 'temper-carbon' which is also in a free state and unaffected by acids, but presenting an amorphous appearance. 3. The carbon of the carbide of iron (cement carbon) forming a definite compound, acted upon by concentrated acids but insoluble in diluted cold acids. This carbide answers to the formula Fe^3C. 4. Hardening carbon, which appears to form a solid solution with the iron (or which is perhaps present as a compound dissolved in the iron) and which is acted upon by cold, dilute acids."—From "Notes on the Chemical Constitution of Cast Iron and Steel," by A. Carnot and E. Goutal, *Annals des Mines*, October, 1900.

furnace after eight hours soaking at a high heat, and allowed to cool in the air, the bar containing 0.15 percent silicon was unchanged in the appearance of the fracture, while the bar containing 1.25 percent was almost gray. It was soft and so ductile that a small piece of it was flattened out under the steam hammer while cold. The bars were then returned to the furnace, subjected to the same heat treatment for six hours longer and allowed to cool, as before. No visible change occurred in the low silicon bar while the other bar was completely converted into gray iron with a uniformly fine grained fracture and dark gray color. This bar was turned in a lathe to a diameter of 1.129 inch (giving an area of 1 inch) and provided with threaded ends for the grips of the testing machine. The metal was readily machinable and the surface was free from "graphite pits" so characteristic of ordinary soft gray iron when machined. This bar was pulled on a testing machine of 100,000 pounds capacity, and the actual load at failure was 47,760 pounds. The elongation and reduction of area were not measured, but were very small. A number of similar tests were made on different size bars giving tensile strengths ranging between 40,000 pounds and 50,000 pounds per square inch, but manufacturers equipped for making converted castings in this way have obtained much higher records than these.

Other Similar Experiments.

The literature upon this novel and interesting subject is very limited, but some valuable papers have been published and it is my desire to present herewith a resumé of the work done by several well-known metallurgists in this country and in Europe.

At the meeting of the Mining and Metallurgical Section of the Franklin Institute, held June 9, 1897, Mr. Charles James described "A Special Process for Treating Cast Iron," the following account of which appeared in the Journal of the institute of July, 1897: "White iron with approximately 2.40 percent combined carbon and 0.4 percent graphitic carbon, is used for the purpose. The castings are placed in a muffle furnace, in which they are subjected to the action of a secret composition (said to be a powerful volatile oxidizing agent) and maintained at a temperature slightly below fusion for five or six hours. The product may be forged and tempered and shows a remarkable increase in tensile strength. The total carbon in the product seems to be the same as in the untreated iron, but combined carbon has been substantially altered into a finely disseminated uncombined carbon.

Doubts were expressed in the discussion which followed, whether the result was not due entirely to the annealing, rather than to the "medicine." The prolonged annealing was thought to be a sufficient explanation of the facts. The process is in commercial operation in a large foundry in Philadelphia, producing hatchets, hammers, etc.

The journal of the Franklin Institute for September, 1900, contains an article by Mr. James on the same subject, giving abstracts of results obtained from daily business practice, extending over a considerable period of time, but though these investigations were made for the guidance of commercial operations, they seem to be of sufficient metallurgical interest to justify their presentation. Mr. James states that the irons used were all of Bessemer quality, the melting charges consisted of a mixture of gray and white irons of which the following is an average analysis:

	C. C.	G. C.	Si.	Mn.	S.	P.
White iron	3.50	.50	.50	.20	.08	.08
Gray iron	.50	3.50	1.30	.30	.02	.03

"The composition of the charges was regulated by the silicon content, which was made to vary from 1.20 to .90 of 1 percent, the average chemical composition of these mixtures being:

Carbon	3.40 to 3.80 percent.
Silicon	.90 to 1.20 percent.
Manganese	.35 to .20 percent.
Sulphur	.05 to .04 percent.
Phosphorus	.04 to .03 percent.

"The iron was sometimes smelted in a cupola, but generally in an air furnace. The following is the average chemical composition of a large number of castings:

C. C. 3.02 G. C. .47 Si. .78 Mn. .12 S. .05 P. .04

"The weight of the castings ranged from half an ounce to 2,000 pounds and over. The time required to effect the carbon change varied from 3½ to 10 hours from the time the castings had attained their full temperature.

"The temperature at which the change takes place in castings of this description lies between the melting point of silver and copper, and may, therefore be approximately taken at 1,850 degrees F.

"The change of carbon in castings subjected to the annealing process, though gradual, is co-extensive throughout any given cross-section of the casting; no hard center or core of white iron, surrounded by softer metal, having ever been observed in any of the castings examined. No matter at what period the annealing may have been arrested, the total surface of any fracture always showed a similarity in the condition of the metal, provided the composition of the metal was homogeneous and the heat treatment had been applied equally to all parts of the casting."

This agrees perfectly with my own observations and it constitutes, moreover, a very interesting and important feature, differing from malleable iron castings where a progressive change occurs; the central portion of a malleable iron casting is sometimes found to be practically unaffected by the heat treatment as to the total carbon and, unless the casting is very thin, the conversion is, in fact, never uniform throughout the section. The same law of progressive change in the proportion of carbon obtains in "case-hardening" of steel, though the operation is the reverse, *i. e.*, carbon is imparted to, instead of withdrawn from, the metal.

The following analyses before and after annealing, given by Mr. James, show very clearly, that the only change effected by the heat treatment is in the condition of the carbon:

	C. C.	G. C.	Si.	Mn.	S.	P.
Before annealing ...	2.60	.72	.71	.110	.045	.039
After annealing	.82	2.75	.73	.108	.040	.039

Mr. James says: "I wish, however, to say that, although for convenience the term graphite is employed in stating the analyses of these castings after annealing, the condition of the carbon differs very materially from graphite, either as found free in nature or as solidified out from gray iron during cooling. The carbon thus formed is evidently identical with what Ledbur has called 'tempering graphite carbon' and is an allotropic form of graphite, and not merely amorphorus carbon."

Mr. James states that both silicon and manganese exert great influence upon the carbon during the annealing process. "The presence of silicon being a necessary condition to the carbon change. In low silicon iron it is very difficult and, in some cases, impossible to effect the carbon change no matter how long the iron is exposed to the heat treatment."

My original investigations did not indicate that manganese possessed any very marked influence on the carbon change in this process, though I am well aware that manganese, especially in the form of ferro-manganese, added in very small quantity to molten car wheel iron, exerts a marked effect upon the chill and on the relative proportion of combined and graphitic carbon. It is a fact, however, that low silicon irons are usually low in manganese and this, I think, is the reason why Mr. James was led to infer that manganese facilitates the carbon change in the annealing process. Mr. James gives no records of strength of the white iron castings converted by him into gray iron by annealing.

Effect of Varying Proportions of Silicon.

Before proceeding to the consideration of other features I desire to call attention in passing to one point which may, I think, have practical value, especially in the manufacture of chilled cast iron car wheels. It has long been known that wheels having approximately the same depth of chill on their treads wear very differently in service, some retain their hard surface until the white iron tread is gradually worn away evenly all around the wheel. Others become soft in spots very quickly, necessitating removal from service long before the wheel has lived its proper life.

We know that the action of the brakes on the wheel heats the tread and it seems to me not unlikely, from the foregoing observations, that when the silicon exceeds a certain amount, say 0.7 percent in any wheel, a similar kind of annealing of the white iron tread of the wheel may occur from the heating

action of the brakes, thus changing the condition of the carbon, at least to a partial extent, and causing the chilled tread to become much softer than would happen under similar conditions, where the wheel is made of metal containing less silicon.

The most recent investigations bearing upon the subject under discussion corroborate the prior observations fully and may be found in the Bulletin de la Societe d'Encouragement pour L'Industrie Nationale, Paris March 31, 1902, under the title: "Sur L'Equilibre des Systemes Fer Carbone," by G. Charpy and L. Grenet.

The authors call attention to the investigations of M. Bakhuis Roozeboom on an interpretation of known facts relating to the constitution of metals formed of iron and carbon, published in the Bulletin de la Societe d'Encouragement, November, 1900, and also to the investigations of Hugh P. Tiemann on "The temperature limits for the separation of graphite from martensite in pure cast iron," published in the *Metallographist*, October, 1901.

The authors say: "One can believe then, as appears to be admitted by Mr. Tiemann, that the abundant separation of graphite, observed by Mr. Royston, was due to the presence of silicon in the white iron castings employed. We have made a great many experiments on this point, and we direct attention in particular to the results obtained on five castings containing practically the same percentage of total carbon and in which the other elements are found only in small proportions, except the silicon which exists in variable quantities.

The following table gives the composition of these castings.

	Carbon.	Silicon.	Manganese.	Sulphur.	Phosphorus.
1	3.60	0.07	0.03	0.01	trace.
2	3.40	0.27	trace	0.02	0.02
3	3.25	0.80	trace	0.02	0.03
4	3.20	1.25	0.12	0.01	0.01
5	3.30	2.10	0.12	0.02	0.01

"These castings had been poured into cold water and did not contain any appreciable proportion of graphite, except the last, where we found 0.20 percent. Fragments of these castings were subjected to annealing, more or less prolonged, at different temperatures. Six tables are given showing the length of time of each treatment, the exact temperatures, and the proportionate change of combined carbon into graphite for each specimen."

The following conclusions are reached. They are announced didactically as laws and may be so accepted:

1. The separation of graphite commences at a lower temperature as the percentage of silicon is increased in the iron.

2. The separation of graphite having begun, it continues at a lower temperature than that required to commence the reaction.

3. At a constant temperature the separation of graphite proceeds at a lower speed according as the temperature is lower and the proportion of silicon is less.

4. The proportion of combined carbon which corresponds to the equilibrium at a given temperature diminishes when the silicon is increased.

The brochure of Messrs. Charpy and Grenet is embellished with several fine micro-photographs showing very clearly the micro structure both before and after treatment. No records are given of tensile strength of the treated specimens and, as it is stated at the beginning of the paper that the white iron specimens were obtained by pouring the metal into cold water, tensile tests could not be made, for the samples were presumably merely small irregular lumps which are far inferior, I think, for such purpose, to the uniform ingots of white iron obtained by pouring high chilling metal into heavy iron molds. I have found it easy in this way, to obtain ingots of white iron of any desired length and of suitable sections, the dimensions depending, of course, upon the proportion of silicon contained in the iron poured. By using a flat ingot mold made of thick cast iron plates, I have obtained flat ingots 5x8x½ inches of perfectly white iron and containing as much as 2 percent of silicon. These high silicon white iron ingots or plates are very readily converted into gray iron by annealing.

Converted White Iron and Malleable.

Although I consider it a misnomer to call castings such as hatchets, axes, etc., made from white iron changed to gray iron by heat treatment and subsequently hardened on cutting edges, steel castings, they are certainly very different from true malleable iron castings or from ordinary gray iron castings, possessing qualities more closely resembling steel.

When the process is carefully and intelligently conducted the product is reliable, but prejudice has been developed by the fact that some of the manufacturers have not thoroughly understood the underlying principles and have turned out castings imperfectly converted. It is, of course, much easier to make perfectly white iron castings from metal very low in silicon, but as I have here shown, such metal is unsuitable for the subsequent conversion by heat treatment into gray iron, and this I believe to be the main cause of many failures.

So far as I know there are no valid patents covering this process of heat treatment of white iron castings for conversion into dense gray iron of high tensile strength, capable of being forged and tempered, by simply changing the condition of carbon without removing any of the original component elements.

As the process of converting white iron castings into malleable iron is well understood and has been carried out on a large scale for many years, I have not thought it necessary to allude to this product further than to show that it is radically different from the converted white iron castings containing all of the carbon of the original metal before the heat treatment. Good malleable iron castings are very ductile and may be bent almost double, and twisted, while cold, without breaking, if the section is light enough to permit of complete malleableizing; but annealed white castings cannot be thus bent even when completely converted into gray iron.

It is true that since the discovery of the fact that hard and brittle white iron castings may be changed by simple heat treatment into strong soft gray iron castings, some makers of malleable castings modify their old methods and practically rely upon heat treatment to anneal their castings without packing them in oxidizing material as formerly, to remove the carbon, but such heat treatment does not and cannot make true malleable iron castings. In other respects, also, converted white iron castings, containing all of the original carbon, differ in physical properties from malleable iron castings in which a large portion of the carbon has been removed.

In conclusion I would say that if we can eliminate the false name of "steel" which has been given to converted white iron castings a distinct advantage will have been gained, for I believe that the new metal is worthy of taking a special place in the metallurgical arts and I anticipate extended practical applications of the process as knowledge of the proper methods of heat treatment and of the valuable properties (as well as the equally marked limitations) of the metal shall become better known and appreciated.

Men of national reputation will deliver addresses at the dedication of the two new buildings at the Michigan College of Mines, Aug. 29. Professor Calvin M. Woodward, dean of the college of engineering of Washington University, St. Louis, will make the dedicatory address for the new mining engineering building. The dedicatory address for the new chemical building will be delivered by Professor Edward Orton, Jr., dean of the college of engineering of the Ohio State University. The address to the graduating class will be made by Hon. Chase S. Osborn, state railroad commissioner for Michigan. The two new buildings cost approximately $95,000.

D. M. Parry, of Indianapolis, president of the National Association of Manufacturers, has received an opinion from Sullivan & Cromwell, New York City, general counsel in America for the new Panama Canal Co., to the effect that all machinery and supplies necessary for the construction of the canal may be purchased in the United States without restraint from the operation of the French laws under which the company was originally chartered. American manufacturers have been considerably agitated over the provision of the law governing the French company, and have feared that purchases of machinery and supplies would have to be made in France. This decision is one of considerable importance to American manufacturers.

The Northside Iron Co., Sharpsville, Pa., lit the fires in the new furnace last week, starting in on a Bessemer mixture.

THE IRON MOLDERS' UNION CONVENTION.

In the August number of the *Iron Molders' Journal* is given a digest of the decisions of the recent Toronto convention of the Iron Molders' Union on important matters brought before it. When it is said that 255 resolutions were presented to the convention and yet that no action was taken making radical changes in the policy of the organization, it will be appreciated that the conservative forces were in control, notwithstanding there was an active and at times demonstrative minority of the other sort. An important proposal was that providing for the referendum method of electing officers instead of by delegate convention. This was defeated. The *Journal* says: "Many of the delegates freely admitted during the debate that their own experience at the Toronto convention had convinced them of the mistake that would be made if it were determined to elect the officers by referendum vote. They confessed that as a result of the disturbances of the past year and the stories that had been circulated, they had come to the convention prejudiced against some of the national officers, but since they had heard their defense and been enlightened as to the difficulties surrounding them, they now entertained modified opinions."

Probably the most important action of the convention was the adoption of the report of the committee on molding machine operators. These are now to be admitted into membership in the union. The *Journal* says that in this action the convention "set the seal of approval upon the proposition to broaden the sphere of influence of the organization and to take a firmer grasp upon the trade, which, by a policy of indifference and disregard for the future was slowly slipping through our fingers." The following extract from the report indicates the line of thought of the committee:

"Consideration of the problems suggested by the advent of the molding machine have demonstrated to us that during the period of great trade activity through which we have recently passed, and which is still with us—a period marked by a remarkable expansion of the American iron industry—opinions have been modified and many artificial restrictions swept aside by the very force of circumstances. Labor saving devices have been in great demand for the foundries, and specializing has become a feature of many lines, and with it all there has been a substantial demand for molders in all branches which could not be supplied from the ordinary sources available.

"As the result of the trend of events and the policy which the organization has been pursuing a class of specialist molders has developed, to whom the mechanics at the trade have been inclined to deny the privilege of membership. Most of them are today outside the pale of the organization. We feel that so long as they remain in their unorganized state they will constitute an element of danger to the Iron Molders' Union and be a constant menace to the wages and conditions of the more skilled followers of the craft. Taking that view of it we are constrained to advise that the union broaden its conception of eligibility to membership and extend its sphere of influence until it will, as nearly as possible, embrace all competent molders in every branch or sub-division of the trade.

"Some hold the opinion that in doing this we should classify our members by issuing special cards upon whose face would be indicated the branch or specialty the bearers follows, as, for example, 'machine operator,' 'bench molder,' 'radiator molder' and so on. This idea we have given very careful consideration and find we can not recommend it to this convention. Such classification would operate to our disadvantage in organizing the specialties in our trade who would resent the restrictions imposed upon them by such classification. There are many members also who being general, or all around mechanics, would object to any classification in their case. If it were decided to classify our membership it would be possible to differentiate as to the term of apprenticeship, but that, while in some cases it would be justifiable, would open the way for complications which would create many other points of friction and disagreement.

"Convinced, however, of the necessity for taking some positive action in order that we may better protect our interests, we strongly advise that all caste feeling be eliminated from our policy, and that we recognize the truth of the suggestion that in a few short years the Iron Molders' Union of North America will be unable to yield adequate protection to its members unless it includes among their number all who work at molding, be it upon the simplest or most complicated of work.

"We therefore recommend that the first three and one-half lines of Art. viii, Sec. 1, be amended to read as follows:

"'Sec. 1.—Any molder who has served an apprenticeship of four years at the trade in any of its branches, or sub-divisions, or who has worked at the trade for four years in any of these branches, or sub-divisions, and is competent to command the general average of wages paid in the branch or sub-division with which he is identified, may be,' etc.

"And further, that it be an instruction to the incoming officers to proceed to organize, wherever possible, all competent machine operators, radiator molders, and all other classified specialist molders, granting them a separate charter, or affiliating them with locals already in existence, as circumstances may dictate."

The ratio of apprentices was discussed at great length, and the committee on this question met in conference during the convention with a committee of the Stove Founders' National Defense Association who went to Toronto for that purpose. The S. F. N. D. A. had asked a change from a ratio of one to eight to one to four, but the convention refused to make any change. The *Journal* says: "There was never a chance for such a ratio (one to four) to be adopted by the Toronto convention, for even in the minds of the most liberal of the delegates such a ratio was more than the necessities of the case demanded. This was unfortunate for it had a strong influence in exciting a prejudice against any departure from the one to eight ratio which has done service for a good many years as the law of the Iron Molders' Union. It was clearly apparent that many of the delegates would have been more favorable to a change if the members of the Stove Founders' National Defense Association alone were involved, but the impracticability of administering a law of limited application was at once recognized and all suggestions looking to a more liberal policy in the matter of apprentices shared the common fate."

The nine-hour day is now a foremost question with the molders. The *Journal* says on this subject: "It was gratifying to note the growing sentiment displayed in favor of a shorter work-day in the foundry. It was truly said that molding, being one of the most arduous of trades, a shortening of the hours of labor was doubly necessary. The subject was handled in a masterly fashion and, although some gave evidence of favoring the adoption of a resolution which named a certain date for the inauguration of a nine-hour day in the foundries of the country, the majority recognized the futility of such resolutions unless supported by an educated popular opinion and ability to enforce the change in every section of the jurisdiction. It was plainly evident that the delegates recognized in a reduction of the hours of labor a more substantial gain than an equivalent advance in wages, and if each of these returns to his constituents and educates them to a like conception, the nine-hour day will soon become an accomplished fact. The convention is now on record as advising all local unions to give preference to the establishment of a nine-hour day over an advance in wages, and if this advice is heeded the shorter work-day movement will attain an impetus that cannot long be resisted."

On the overture from the Coremakers' International Union asking the Iron Molders' Union to turn over core-making to the former and give up the right of iron molders to make cores under any circumstances, the action was adverse. The convention, however, endorsed President Fox's suggestion that core-makers be admitted as members of the Iron Molders Union, and the coremakers' union at its convention in September will discuss the proposal to affiliate in a body with the Iron Molders' Union.

The Cleveland Furnace Co. has completed the purchase of two tracts of land of 80 and 60 acres respectively on which options were held and the company now has 175 acres. Preliminary work on the erection of the new blast furnaces is progressing rapidly.

The stockholders of the Pope Tin Plate Co., Wheeling, W. Va., have increased their capital stock from $500,000 to $750,000. Of the increase $100,000 will be issued at once.

PENNSYLVANIA IRON AND STEEL PRODUCTION.

The report of the bureau of industrial statistics of Pennsylvania for last year gives some interesting facts. For the year 1901 Pennsylvania produced 7,364,295 gross tons of pig iron, an increase over 1900 of 992,607 tons, and reckoning back for a period of five years to 1896 we find an increase of 3,337,945 tons, or 82.9 percent. The capital invested to bring about this production was $152,075,575, or fully three times the capital invested in the active plants five years ago. The average realized value in 1901 was $14.52, a decrease from 1900 of $2.03, but an increase over 1896 of $3.31 per ton.

The number of workmen employed was 14,749, a decrease from 1900 of 1,036, but an increase over 1896 of 3,169, or over 27 percent. The aggregate of wages paid out was $8,646,479, an increase over 1900 of $146,285, and an increase over 1896 of $4,057,314, or over 88 per cent. The average yearly earnings for all workingmen employed was $586.24, an increase over 1900 of $47.74, and an increase over 1896 of $189.94, or nearly 48 percent. The average daily wage was $1.85, an increase over 1900 of 18 cents, and an increase over 1896 of 48 cents, or 35 percent.

The steel production was as follows: Bessemer, 4,319,144 gross tons; open hearth, 3,554,828 gross tons; crucible and other processes, 85,748 gross tons, making a total production of steel in the State of 7,959,720 gross tons, an increase in the production of Bessemer over 1900 of 830,575 tons, and an increase over 1896 of 2,026,330 tons, or an increase of 88.4 percent; an increase of open hearth over 1900 of 851,860 tons, and an increase over 1896 of 2,545,220 tons, or an increase of 252 percent; an increase of crucible and other processes over 1900 of 21,248 tons, and an increase over 1896 of 42,641 tons, or an increase of 98.9 percent; and an increase in total production over 1900 of 1,702,945 tons, and an increase over 1896 of 4,614,191 tons, or 137.9 percent.

The table shows that Allegheny County produced nearly 65 percent of the entire production of steel in the State, and that over 80 percent of the production came from counties west of the Allegheny Mountains.

Trade Publications.

Special price list No. 62 A, issued by the Jeffrey Mfg. Co., of Columbus, O., treats of water elevators and is well illustrated with views of the various machines for irrigating and drainage purposes.

The lathe catalogue of the R. K. LeBlond Machine Tool Co., of Cincinnati, covers some 72 6x9 pages. A varied line of lathes is described at length with numerous illustrations; there are also descriptions of turret attachments, reaming stands, vises and stands, chucks, etc.

The Skinner Chuck Co., of New Britain, Conn., is sending out a catalogue and supplement of the Skinner chucks. The line comprises lathe, drill, planer chucks and faceplate jaws. The supplement enumerates the following additions to the line given in the earlier catalogue: Universal geared scroll, lever scroll, two-jaw, round and body box chucks; independent two-jaw, round and body box chucks; the Hartford, key, Acme and Peerless drill chucks.

The catalogue of the Grant Tool Co. of Franklin, Pa., recently issued and known as "B", is an attractive specimen of typography and contains some fine halftones. The pamphlet is in the main devoted to railroad and other machine tools; forge, engine, turret, pattern makers', and hand lathes, milling machines, semi-radial drills, boring machinery, etc.

The line of pipe threading and cutting-off machinery manufactured by the Bignall & Keeler Maunfacturing Co., of Edwardsville, Ill., is described in a neat standard size compilation of circulars. This takes the place of catalogue No. 14 which is now out of print. A general catalogue is in course of preparation.

The Garvin Machine Co., of New York, has issued Catalogue No. 8 treating of screw machines, monitor lathes, forming machines and double turret screw machines. These machines are listed in a number of sizes and the pamphlet contains reproductions of screw machine work, collets, special turrets, etc.

LAKE SUPERIOR IRON MINES.

The *Mesabi Ore*, of Hibbing, Minn., reviews at length the condition of mines of the United States Steel Corporation in the Hibbing district. It says that all of the old mines are being worked as never before, new ones are making good records and preparation is being made to add others to the list. Nearly all of the mines came to the opening of the shipping season with heavy stock piles, which have been greatly reduced in addition to the ore being shipped as fast as raised. At the present time the company is operating nine mines in the Hibbing district. They are the Hull, Rust, Burt, Day, Sellers, Pillsbury, Clark, Chisholm, Glen, and the tenth is being opened. In addition to these operating properties the company owns a number of large undeveloped ore bodies near at hand. The company is spending a large amount of money this year in improving its properties and adding to the conveniences. The new mine for which the company is breaking ground is one-half mile east of the Oliver-Snyder mine and a mile north of Chisholm. The ore body is estimated at 12,000,000 tons. The Glen mine, the youngest of the Minnesota properties, is fast taking a place of importance in the list of mines in this district. The property is well opened underground and is making regular daily shipment. It is estimated that the output for this season will reach 50,000 tons. Pillsbury mine is making a good record this year and the estimated output will be easily reached. The Clark had an allotment of 250,000 tons, but it is believed that the output for this season will overreach that figure by at least 50,000 tons. The daily output is now about 1,500 tons, and 300 men are employed. Some exploratory work is being done on the Chisholm property, and when it is completed a second shaft will be put down. The year's output is estimated at 300,000 tons. The stripping of the north side of the Burt mine is progressing, and it is expected that mining from the Burt open pit will be started early next month. The stripping contract calls for the removal of 375,000 yards of earth, the removal of which will leave an opening half a mile long by 250 feet wide and to a depth of 35 feet. The contractors are working day and night shifts and are employing 160 men. The Hull and Rust properties are doing exceptionally well. The early season estimate of the output of the Steel Corporation mines of the Hibbing district (the Glen not being listed at that time) was 1,750,000 tons, but present indications are that the estimate will fall considerably short. The Glen will add 50,000 tons and all of the mines, with the possible exception of the Chisholm, will overreach the estimate. The total may reach 2,000,000 tons.

The Bird Iron Co. has decided to suspend operations at the James property near Crystal Falls, Mich. The pumps will be pulled and the mine allowed to fill with water. The reason given for abandoning the property is that further work there would necessitate the purchase of a complete new outfit of machinery and pumps.

There are now 175 steam drills at work on the Mesabi range. To operate these more than 1,000 men are employed and the monthly payroll of the drill explorers and syndicates amounts to at least $70,000.

The Traders mine of the Antoine Ore Co. has been sold to the Republic Iron & Steel Co.

The Detroit *Free Press* presents a page of illustrations and other descriptive matter in regard to the Great Lakes Engineering Co., of that city. The product and plant of the company receive attention in detail and among other interesting information something of the industrial history of the old firm is disclosed. The plant, up to the time of its purchase by the present company, was known as the Riverside Iron Works, under the proprietorship of Samuel F. Hodge & Co. The first triple expansion engine that turned a wheel on the lakes was built here. Two of the large stationary engines at the Detroit Waterworks, with a pumping capacity of 24,000,000 gallons every 24 hours, six at the Municipal Lighting Plant, the former 13 revolutions per minute, the latter 200 per minute; more than 80 of the engines on the finest steamers in the lake service, and engines of all kinds without number have been constructed through the unusual facilities in the possession of this famous plant.

INDUSTRIAL SUMMARY.

[If you are in need of machinery of any description, please notify *The Iron Trade Review*, and we will put you in communication with our advertisers at once.]

New Buyers in the Market and Some of Their Wants:—

The Queen City Wheel Co., of Cincinnati, was incorporated by G. H. Williamson, W. W. Boob, A. T. Cassingham, Albert Williamson and John P. Dumas. The capital stock is $10,000.

The Auto Machine Co., Augusta, Maine, has been incorporated with a capital of $250,000 for making and selling machines for the automatic selling of merchandise.

The National-Fulton Brass Mfg. Co., of Detroit, has been incorporated with a capital stock of $400,000, the stockholders including George H. Russel, William C. McMillan, M. T. Conklin and J. F. Harrigan. The National-Fulton Co. is a reorganization of the Fulton Iron & Engine Works of Detroit, which have been in existence for 50 years. The new company besides largely increasing the facilities for output of its Detroit plant has already perfected plans for new works at St. Louis.

The Ferris-Clevis Co., with a capitalization of $30,000, has been organized at Oshkosh, Wis., for the purpose of operating a malleable foundry. A foundry will be erected immediately containing one furnace and two annealing ovens. The officers of the company are Dr. W. B. Thewalt, president; R. T. Schuttler, secretary, and D. L. James, treasurer.

The Uniontown Engineering & Construction Co., of Uniontown, Pa., has filed application for a Pennsylvania charter. A plant for the erection of ladle cars and Bessemer converters will be erected at Uniontown and the company is in the market for riveting machinery, shears and other heavy machinery for the equipment of a plant of this kind.

The Bon Air Coal & Iron Co., of Nashville, Tenn., recently organized with a capital of $5,000,000, half of which is preferred and the remainder common, is a consolidation of the Bon Air Coal Co. and the Buffalo Iron Co. John P. Williams has been elected president of the consolidation; J. M. Overton, vice-president and general manager; C. Cooper, treasurer, and W. C. Dibrell, secretary. The following board of directors was elected: John P. Williams, J. M. Overton, W. C. Dibrell, S. J. Keith, A. H. Robinson, M. M. Gardner, J. H. Fall, J. M. Dickinson, Edgar Jones, T. M. Steger and S. Murray. The following executive committee has been elected: S. J. Keith, M. M. Gardner, A. H. Robinson, Edgar Jones and W. C. Dibrell. As the furnaces of the Buffalo Iron Co., four in number, receive their supply of coke from ovens located in Virginia and West Virginia, the consolidation was made desirable owing to the large coal properties owned and controlled by the Bon Air Coal Co. It is the intention to immediately develop considerable of this property and several coking plants will be built to furnish a supply of coke for the furnaces. Improvements are also to be made to the furnace properties in the very near future.

Dyer Bros.' Golden West Iron Works, has been incorporated in California to carry on the manufacture of iron and steel products at San Francisco, Cal. Capital, $150,000. Directors: G. H. Dyer, R. Dyer, W. J. Dyer, S. Dyer and H. Bauer.

The Safety Angle Bar & Railroad Supply Co., has been organized at Kansas City, Mo., with a capital of $2,500,000 for the purpose of erecting a rolling mill to contain a structural train and merchant mills. The company has been incorporated under the laws of the State of Arizona.

Chattanooga Machinery Co., Chattanooga, Tenn., wants secondhand blower for cupola, 36 inches inside diameter, and a 10-ton hand crane of 30-foot span.

Calcasieu Iron Works & Mill Supply Co., Lake Charles, La., will purchase lathes, hydraulic press, pipe machine, cranes, irrigation pumps and supplies, mill supplies, etc.

W. H. Blackman, 560 Central Ave., Atlanta, Ga., is in the market for boring mill, 48-inch radial drill press and bolt cutter.

The London Rolling Mills, Ltd., London, Ont., has been incorporated with a capital of $200,000.

The Indiana Rolling Mill Co., New Castle, Ind., recently incorporated with $300,000 capital, will erect a plant for the manufacture of sheet steel suitable for the manufacture of shovels, which product will be utilized by the Indiana Shovel Co., to which the new company is closely allied. The equipment will consist of three stands of three high rolls, two 500-h. p. Corliss engines and 1,000 h. p. boiler capacity. The directors follow: C. W. Monch, David Kinsey, Fred P. Maus, C. S. Bernley, and E. M. Bundy.

The National Light, Heat & Power Co. has been incorporated at St. Louis with a capital stock, all paid, of $1,500,000. The shareholders are: Frank M. Gordon, Franklin C. Burdette, Fred. L. McGahan, Harry C. Barter, Chas. Sutter, L. C. Spooner and George S. Robinson.

Arthur H. Kay, Lewis T. Pim, Francis H. Pim and others have incorporated Kay-Pim Mfg. Co., of St. Louis, with capital of $25,000, to operate foundry and machine shops.

The Crescent Appliance Co., of Cleveland, has been incorporated with a capital of $50,000 by James H. Bevington, Melvine Grossman, and George M. Potter. The company will manufacture mechanical novelties.

Petersburg Iron Works Co., Petersburg, Va., wants delivered quotations for immediate delivery on one combined punch and shear to punch ⅞-inch hole in ⅝-inch plate, 25-inch throat, and to shear ½-inch plates, 25-inch throat.

The United Hardware & Supply Co. has been organized at Titusville, Pa., with a proposed capitalization of $6,500,000. Some of the largest hardware houses in New Castle, Oil City, Titusville, and other towns in the Northwestern section of Pennsylvania have signified their intentions of affiliating themselves with the consolidation. S. S. Bryan and Joseph Seep, of Titusville; Kirkland Smith, of New Castle, and Seep Bros., of Oil City, are the promoters of the combination.

The Herbert Mfg. Co., of New York, has been incorporated with $150,000 capital for the purpose of operating a plant for the manufacture of machinery and mechanical appliances. E. L. Suffern, H. A. Herbert, and W. B. Herbert are the incorporators.

The Hydrogen Furnace & Fuel Co., of New York, has been incorporated with $250,000 capital for the purpose of engaging in the manufacture of engines, dynamos, etc. Lorenzo de Zavala, A. P. Cranston, and C. H. Hoffman are the incorporators.

The Daellenbach-Turner Mfg. Co., of New Castle, Pa., has been organized for the purpose of erecting and operating a gas engine plant at Ellwood, Pa. G. E. Turner, J. M. Flannery, and Carl Daellenbach are the incorporators.

The Williams Wire Hinging Machine Co., of Whitehall, N. Y., has been incorporated with $65,000 capital. William H. Potter, William McMurray, and William Edge are the incorporators.

The Cullen Iron Mfg. Co., of Duluth, Minn., has been incorporated with $5,000,000 capital for the purpose of engaging in the manufacture of iron and steel products. The incorporators are Richard Cullen, Catherine Cameron, and James T. Manning.

The Anderson Bridge & Scraper Co. has been incorporated at Anderson, Ind., with $50,000 capital for the purpose of operating the plant of the Northwestern Scraper Co., which was recently purchased by the incorporators of the new company. George Nichol, E. E. and T. J. Nichol, A. J. Makepeace, and A. J. Applegate are the directors.

The Cincinnati Gas Engine Co., Cincinnati, O., is in market for a second hand drill press, about 30 inches, and a medium size radial drill.

New Construction:—

At Barberton, O., the first brick for the main building of the Pittsburg Valve & Fittings Co.'s plant has been laid. Two more large buildings have been added to the contract which will make 11 buildings and there are still more to follow.

The Detroit Vapor Stove Co. has purchased a site and will erect a brick factory, 50x100 feet, four or five stories, with a smaller building.

The Michigan Steel Boat Co., Detroit, will soon erect a large addition to its present plant. The new structure will be of frame, 600x80 feet, and three stories. F. E. Wadsworth is now practically sole owner of the company, having purchased the stock held by C. G. and L. H. Bullard and A. E. Chambers.

The Mansfield Engineer Co., Mansfield, O., has commenced work on a new two-story brick power house, 36x50, just to the west of its present shops. The building will contain one

compound engine, one simple engine, one air compressor, three boilers and two electric generators. All machines in the works will be run by electric motors, the current for which will be furnished by the larger of the two generators. The plant will require some 12 motors ranging from 1½ horsepower to 50 horsepower. The smaller of the two generators will furnish the current for the electric lights placed throughout the buildings.

An addition is being erected to the foundry of the Novelty Iron Works, Canton, O. The new cupola will have a capacity of from 20 to 25 tons per day.

The Solvay Process, of Detroit, will duplicate the present set of ovens to meet the demand for coke of the new blast furnace of the Detroit Iron & Steel Co.

The plant of the Phœnix Iron Works, Portland, Oregon, which is being built to take the place of the plant recently destroyed by fire, will consist of a machine shop and boiler house, 70x100 feet, two stories; foundry, 60x80 feet, and a pattern shop, 30x50 feet. All equipment has been purchased.

The Hiller-Allen Wind Engine Co., of Napoleon, O., will erect two brick buildings, one 40x70 feet and the other 40x50 feet. One will be a store house and the other a foundry.

The New Jersey Zinc Co., of Pennsylvania, is erecting a furnace at Palmerton, Carbon County, Pa. It will be 60x14 feet and will be ready for blast early in 1903. Anthracite coal and coke will be used for fuel. Spiegeleisen will be made from zinc residuum. The furnace will have an annual capacity of about 20,000 tons.

The Record Foundry & Machine Co., Livermore Falls, Maine, which has taken over the business and plant of J. A. Record, will erect a machine shop, 60x100 feet, and a foundry 36x106 feet. The plant will be equipped for the manufacture of pulp and paper mill machinery. J. A. Record is general manager.

The plant of the May-Austin Machinery Co., Detroit, Mich., which was recently destroyed by fire, is to be rebuilt on a site in the vicinity of the destroyed plant.

The McNab & Harlin Mfg. Co., Paterson, N. J., will greatly increase the size of its brass manufacturing plant by the erection of two additional buildings. A brick storehouse, three stories high, 100 feet long and 50 feet wide is to be erected as well as a new manufacturing building three stories high and 34x200 feet. The brass foundry will also be materially increased in capacity.

The United States Pump & Supply Co., Toledo, O., has completed plans for the erection of its new plant. The main building, which will include the fitting and machine departments, will be 300x40 feet in size, one-half of the structure to be two stories high and the remainder one story. The rear of the main building will be equipped for foundry purposes and all the castings for use in the plant will be cast therein. Several other buildings are to be erected for warehouse and pattern storage purposes.

The John A. Mead Co., of New York, will erect a two-story machine shop at Grand Crossing, Ill., to be 130 feet long and 60 feet wide.

The Mechanics' Foundry & Machine Co., Fall River, Mass., will build an addition, 30x66 feet.

It is understood that the Louisville & Nashville R. R. is making plans for the entire reconstruction of its shops in Louisville. The plans will call for an expenditure of $2,500,000.

The V. A. and F. Brown Co., manufacturers of machinery, Elizabeth, N. J., will soon make extensive improvements and additions to its factory. About $100,000 will be expended for several new iron framework structures, in addition to the wooden and brick buildings now employed.

The Stirling Co., Barberton, O., will build a large addition to its boiler works.

Civil engineers in the employ of the New York Central & Hudson River R. R. have completed a survey for a large machine shop which will shortly be erected east of the new round house in the village of West Albany, N. Y. One of the largest electric generating plants in that State is to be erected at West Albany for furnishing electric light for the shops, the freight yards and probably for the Union station.

Plans have been completed for the new plant of the Pittsburg Warming & Ventilating Co., which is to be erected at Wheeling, W. Va. The main building will be 100x200 feet, and the wareroom will be 100x50 feet.

The Scullin-Gallagher Steel & Iron Co., St. Louis, has had plans prepared for one-story foundry addition, 150x200 feet, to cost about $20,000.

The plate mills of the Portsmouth Steel Co., Portsmouth, O., are to be repaired and put in operation. A new electric crane will be put in.

The American Tool & Machine Co., 109 Beach St., Boston, Mass., is ready to figure for a power plant at Hyde Park, Mass. It will be of brick and iron, two stories, 40x80 feet.

Plans have been completed for an addition to the Deane division of the International Pump Co., at Holyoke, Mass. The building will be 60x200 feet and will be used as a brass foundry and machine shop.

The Chapman Valve Mfg. Co., Indian Orchard, Mass., has let the contracts for extensive alterations and enlargements.

W. H. Millsbaugh, of Salem, O., has purchased the Co-operative Foundry at Sandusky, O., which he will remodel and enlarge, adding a complete machine shop.

The Twin City Rapid Transit Co., Minneapolis, will build a power plant at a cost of $1,500,000.

The F. M. Delk Mfg. Co., of Arcanum, O., expects to erect buildings and be ready for manufacturing handles by Dec. 1, 1902. The location has not been decided, but will be in Missouri or Tennessee.

The Sigourney Tool Co., Hartford, Ct., has let the contract for a new building, 200x50 feet, of brick, three stories. It will be of mill construction and will be used for the manufacture of the patented machinery used by the Smyth Mfg. Co.

The old Philadelphia firm of David Isupton's Sons, which has been successfully conducted under the sound business principles of its founder, has recently been incorporated as the David Lupton's Sons' Co. The business has expanded from a small tinware store in 1871 to a manufacturing plant covering four acres in 1901, and is still growing at such a pace as to make it necessary to further enlarge the buildings.

The Otterman Mfg. Co., of Bridgeville, Pa., is enlarging its plant and putting in more machinery. The company makes a specialty of patent snap hooks.

The recently incorporated New Jersey Galvanizing & Tinning Works, of Newark, N. J., will soon have completed an up to date plant for manufacturing galvanized and tinned irons.

The Wolverine Brass Co., Grand Rapids, Mich., will erect a new brass foundry.

The National Malleable Casting Co., Chicago, Ill., will move its foundry from the present location at Rockwell and 26th Sts. to a site of twenty acres, recently purchased at Forty-sixth Ave. and 22nd St.

Fires and Accidents:—

One of the foundries of John Seaton, Atchison, Kas., was burned recently, loss $10,000; partly covered by insurance.

The boiler plant operated by R. Munroe & Son, Pittsburg, Pa., was damaged by fire to the extent of $15,000 last week.

A fire at Niles, O., in the plant of the National Fireproof Co., caused a loss of $25,000. Much valuable machinery was destroyed. A can of gasoline exploded; insurance small.

The Pittsburg District:—

The Pope Tin Plate Co., Pittsburg, has placed in operation five of its tinning stacks at its new plant, Steubenville, O. The remaining stacks will be placed in operation shortly. Seven of the hot mills of the plant are in operation at present and the remaining five will be placed in operation within a month.

The Oliver & Snyder Steel Co. is preparing to increase its coking facilities fully one-third by the erection of a modern plant to be known as No. 3, near Vance's Mills on the Redstone branch of the Pittsburg, Virginia & Charlestown railway. The cost of the new plant is estimated at about $300,000. The new plant will consist of about 300 coke ovens increasing the company's holdings to nearly 1,100, with a daily capacity of 2,400 tons. To provide coal for the new plant another mine is to be opened nearby. The Vulcan Iron Works, of Wilkesbarre, will install the hoisting engine and the steel front headings and tipple will be built by the Penn Bridge Co., of Beaver Falls, Pa.

For the purpose of erecting a large addition to the plant of

the W. DeWees Wood Co., of the American Sheet Steel Co., McKeesport, Pa., a large tract of land adjoining the plant has been acquired during the past week. The work of erecting the addition will be commenced shortly.

Wilson & Snyder Pump Co., of Pittsburg, has been awarded the contract for the installation of pumps with a daily capacity of 3,000,000 gallons at Beaver Falls, Pa., for the Beaver Valley Water Co.

A special meeting of the board of directors of the United States Wire and Nail Co., of Pittsburg, will be held at the company's offices, Lewis building, on Saturday, August 23, for the purpose of voting for or against an increase in the capital stock. If the stock is increased extensive improvements will be made to the company's plant at Shousetown, Pa.

The deal for the consolidation of the Pressed Steel Car Co., of Pittsburg, with the American Car & Foundry Co., of St. Louis and New York, has fallen through entirely. The Standard Steel Car Co., whose new plant is under way at Butler, Pa., was invited to enter the combination and on account of its refusal the deal has fallen through. The deal has been under way for some time.

General Industrial Notes:—

Smoke issued from the big stacks of the West Allis plant of the Allis-Chalmers Co. last Thursday morning for the first time, and now the company will be enabled to use the big engines at the works. Heretofore the company has been obliged to use temporary power secured from smaller apparatus, but the big machinery has now all been installed and the output of the plant will be greatly increased.

George H. Chase has been appointed receiver of the Thomas Brass & Iron Co., of Waukegan, Wis. The bill says that the company owns property and assets worth about $200,000 and that its debts do not exceed $42,000. The good reputation made by the managers of the company during its career, the complaint says, is valuable, and the concern, if properly managed, can keep going and pay off its debts.

Pawling & Harnischfeger, Milwaukee, will enlarge their plant and have commenced the erection of a foundry and machine shop. The firm has recently purchased from Gardiner Campbell & Co. all its tools, fixtures and machinery. The principal output of the Campbell firm is bells. Pawling & Harnischfeger make a specialty of electric cranes, and do not intend to go into the bell founding business, the Campbell company having retained its bell patterns.

We have been officially advised by the Canton Crucible Steel Co., Canton, O., that no action has been taken by the stockholders looking towards the removal of the plant from Canton, O., or its dismantlement. The company reports demand excellent for its product which consists of the highest grades of crucible steel.

The Iroquois Iron Co., of South Chicago, last week filed a trust deed executed by Cochrane Armour and George A. Tripp, in which the Chicago Title & Trust Co. was named as trustee to cover the recent issue of $400,000 of first mortgage improvement bonds. The first $100,000 of the bonds are payable in two years and the rest at intervals of six months with interest at 5 per cent. The bonds are secured by the plant at South Chicago and twenty acres of land, having 1,000 feet of dock frontage on the Calumet River. The value of the entire property was stated as follows: Land, $300,000; furnace and plant, $950,000; total, $1,250,000.

The annual meeting of the stockholders of the Old Dominion Iron & Nail Co., Richmond, Va., was held last week and officers were re-elected as follows: George V. Lewis, president; E. L. Bemiss, vice-president; J. B. Carter, treasurer and H. R. Wyat, secretary. R. M. Blankenship was appointed superintendent.

The converting and rolling mill departments of the Ohio plant of the National Steel Co., Youngstown, O., were shut down several days last week for repairs. This is the first shutdown of the plant for nearly six months.

Two pots in the galvanizing department of the Youngstown Iron Sheet & Tube Co., Youngstown, O., were placed in operation last week as well as the lap weld department of the tube mill. The entire plant is expected to be placed in operation in full in a short time.

At a meeting of the Youngstown Manufacturers' Association, which comprises all of the firms at Youngstown, O., employing machinists, it was decided to advance the wages of all machinists 5 percent. This advance was satisfactory to the machinists and the scale was signed for a year.

The annual meeting of the Highland Iron & Steel Co., Terra Haute, Ind., was held last week and a very favorable report was presented to the stockholders. With the additions in operation that were recently completed the daily output reaches 200 tons. Officers were re-elected as follows: Philip Matter, president; J. L. Smith, vice president; W. C. Ely, treasurer and general manager, and W. M. Myers, secretary.

The Buena Vista furnace, located at Buena Vista, Va., has been sold by the Virginia Coal, Iron & Coke Co., to the Allegheny Ore & Iron Co., of Iron Gate, Va. The purchasers took charge of their new property on Aug. 15.

The Anderson Bridge & Scraper Co., of Anderson, Ind., will be the successor of the Northwestern Scraper Co., which was sold at receiver's sale some time ago. The capital of the new company is $30,000. The plant, which has been closed since the old company went into the hands of a receiver, will be reopened.

The charcoal blast furnace and other property of the Peninsular Iron Co., at Detroit, Mich., has been sold to Fred L. Smith. Mr. Smith has leased the plant to the Peninsular Iron Mfg. Co., Ltd., for a term of years. The furnace is now being repaired and will be ready for blast in about six weeks. The officers of the new company are Joseph H. Berry, chairman; W. G. Smith, treasurer, and Solon Burt, secretary and manager.

The entire plant of the Troy Steel Co., Troy, N. Y., has been sold at auction by direction of the Supreme Court of the State of New York to satisfy a judgment obtained by the Guarantee Trust Co., of New York. A. F. Donovan, of St. Louis, was the successful bidder and secured the entire property for $525,000, but refused to state in whose interest the property was secured. Other bidders for the property were the Continuous Rail Joint Co. of America and the Ludlow Valve Manufacturing Co. The Troy Steel Co. was capitalized at $2,500,000 and all the stock issued was common. The property included three blast furnaces on Breaker Island, opposite Troy with an annual capacity of 160,000 gross tons but which have been idle for nearly five years. The Albany Iron Works at Troy, owned by the company, has been leased by the Continuous Rail Joint Co. of America, with headquarters at Newark, N. J., and the lease does not expire until May 1, 1910. The Bessemer Steel Works on Breaker Island with an annual capacity of 200,000 gross tons of ingots contains three 15-ton Bessemer converters, 4 cupolas, 4 spiegel cupolas, two 5-hole Hainsworth pit furnaces and 24 soaking pits. The plant also contains a blooming mill and billet mill. The Rensselaer Iron Works at Troy, also included in the sale, contain four trains of finishing rolls with an annual capacity of 25,000 gross tons. It is probable that the new purchasers will place the plant in operation as soon as the necessary repairs can be made.

At a special meeting of the stockholders of the Pennsylvania Steel Co., Aug. 12, an issue of $7,500,000 5 percent 30-year bonds was authorized. These bonds, which are all subscribed, are to provide funds to pay for the Cornwall Iron Ore Banks, blast furnaces at Lebanon, Pa., and a controlling interest in the Cornwall & Lebanon Railroad. They will be secured by a first mortgage on these properties, which were bought at the time the Pennsylvania Steel Co. was reorganized in May, 1901. Settlement was delayed by legal question as to titles. These were confirmed by the Supreme Court of Pennsylvania about two months ago. The new bonds will also pay for the construction of coke ovens at Lebanon, with an output of about 600 tons a day, or about enough to supply the Pennsylvania Steel Co.'s furnaces there with fuel.

The Buckeye Engine Co., of Salem, O., has secured a contract through the American electrical engineering and contracting firm of Bagnall & Hilles, of Yokohama, for a 500-horsepower cross compound condensing engine for direct connection to a 350-kilowatt generator, to be built by the General Electric Co. The machinery is intended to serve as equipment for the Kyoto Electric Light Co., of Kyoto, Japan.

Capt. O. L. Wasson, long engaged in mining in New York and Minnesota, died Aug. 14 at the Stephens mine near Virginia, Minnesota, from heart disease. He was 42 years old.

PERSONAL.

E. G. Rust, general superintendent of the Colorado Fuel & Iron Co.'s works at Pueblo, and A. H. Helander, chief engineer, have resigned in order to open an engineering office in Philadelphia. Messrs. Rust and Helander are both well and favorably known in the engineering, and steel and iron business, and have for several years been prominently connected with the extensive improvements which have been made at the steel works at Pueblo, in connection with which Mr. Rust was for several years chief engineer, and has been in charge of all construction work at that point.

President Patrick Dolan, of the Pittsburg district of United Mine Workers of America, sailed this week for London, Eng., to attend the annual convention of the British Trades Congress.

A. H. Jackson, one of the officers of the Jackson Knife & Shear Co., Fremont, O., and prominently connected with other industries, has been nominated for Congress by the Republicans of the 13th Ohio district.

Col. George D. Wick, of Youngstown, O., has returned from his trip to Europe, much improved in health. He will spend the remainder of the summer with his family at their summer home at Alder Creek, N. Y. The report that he will again become identified with the Youngstown Iron Sheet and Tube Co. in the capacity of president has been denied by officials of that company.

Thomas M. Higgins has been appointed general yardmaster of all the yards of the Lackawanna Steel Co., Stony Point, Buffalo, N. Y.

F. F. Vandevort has resigned as general manager of the Chester Iron and Steel Co., Chester, Pa., and has been succeeded by Walter B. Ferrier, formerly connected with the Carnegie Steel Co., Pittsburg.

George L. Reis, general superintendent of the Milwaukee works of the Illinois Steel Co., has resigned to accept the position of superintendent of the Minnequa rolling mills and steel works of the Colorado Fuel & Iron Co., at Pueblo, Col.

H. P. Bope, first vice president of the Carnegie Steel Co., has been camping on Harsen's Island, on the St. Clair River, Mich., with the Pittsburg regiment of the Boys' brigade of which he is colonel.

National Enameling and Stamping Co.'s Report.

The annual report of the National Enameling & Stamping Co. shows that after deducting everything in the nature of operating expense, there was left a profit of $2,566,817. From this was deducted the salaries of officers, directors, etc., amounting to $106,908, interest amounting to $13,515 and depreciation footing up $457,875, relatively a large sum on the amount of business. This left net profits of $1,988,428, out of which were paid interest charges of $107,593 and a dividend of 7 percent on the preferred and 4 percent on the common, together requiring $1,051,016. There were written off also $28,500 on account of organization expenses and $132,028 on account of property accounts, leaving a surplus for the year of $669,288. The surplus forward at the beginning of the year was $1,110,417, making the total surplus at the end of the year $1,779,906. Of this sum, $500,000 were transferred to a general reserve account, leaving $1,279,707 as undivided profits.

Taking the net profits of the year as $1,988,428 and deducting interest of $107,593, leaves $1,780,835 available for dividends. The dividend paid on the preferred stock was $587,762, which was on less than the 83,966 shares of preferred outstanding at the end of the year. The dividend of 4 percent on the common, calling for $463,254, was also on considerably less than the 154,418 shares outstanding at the end of the year. Assuming all the preferred to have been issued and to call for $700,000, the earnings on the common stock last year would have been $1,080,835, or something over 5 percent on the authorized $20,000,000 of common stock.

Frank C. Roberts & Co., engineers, of Philadelphia, acting for their clients, Bolckow, Vaughan & Co., Ltd., of Middlesborough, England, have placed the contract for blowing engines with the Southwark Foundry & Machine Co., of Philadelphia. There are to be three compound engines of the vertical disconnected quarter crank type.

ADDITIONS TO THE PENNSYLVANIA ENGINEERING WORKS.

The Pennsylvania Engineering Works, New Castle, Pa., was organized in 1899 and has made many additions to the factory since the purchase of the Witherow plant. An addition to the machine shop was built in February. It is on the north side of the main building with dimensions of 90x130 feet. The new machinery added includes a Betts planer, 25 feet by 10x10; a 27-inch Johnson engine lathe; a 42-inch engine lathe and a 6-foot radial drill, from the American Tool Works Co., and a horizontal boring and milling machine made by the Niles Tool Works. The electric power plant is to have a handsome new brick building just north of Nutt St. The electric power house is 43x63 feet and besides the engines and generators from the other power house in the main building one new 225-horsepower Buckeye engine and one 150-kilowatt Bullock electric generator will be added. The steam power building is 50x52 feet, and is being built alongside of the electric plant. Besides the boilers now in use three 150-horsepower water tube safety boilers will be installed by the Erie City Iron Works.

The old boiler shop is being torn down to make room for a structure 300 feet long and 64 feet wide. In this department the heavy plate work is done. Two 15-ton cranes from the foundry will be placed in the boiler shop while one 30-ton crane with auxiliary hoist of 5 tons from the Northern Engineering Works at Detroit has already been placed in the machine shop and two 20-ton cranes each with 5-ton hoists from the same firm will be put in the building. The yard crane runway under construction on south side of the works is 102 x64 feet. The Case Mfg. Co., of Columbus, O., is furnishing a 15-ton crane for this building. For outside construction work 12x12x12-inch Laidlaw-Dunn Gordon Co.'s air compressors and a new hoisting engine have been secured. A complete hot air heating and ventilating system is being installed which will greatly add to the comfort of the employes. It consists of a horizontal steam engine and fan blower furnished by the William Bagley & Sons Co., of Milwaukee, Wis. A heating and ventilating plant will be put in each of the machine and boiler shops, but the boiler shop plant is being put in by the Sturtevant Co., of Boston.

The Pennsylvania Engineering Works do construction work for the largest iron manufacturing concerns in the country, including blast furnace and steel plant construction, general machine and plate work of the heaviest nature and iron and steel car construction. George Greer is president of the company; Edward King, treasurer and general manager; W. H. Shipler, superintendent; C. L. Baldwin, purchasing agent; E. M. Beadel, engineer, and John H. Furst, assistant engineer. All except Mr. Greer, who is district manager for the American Tin Plate Co., give their undivided attention to the business.

Incorporators of the new South Chicago Savings Bank have taken over the private bank of A. G. Ingraham & Co., known as the South Chicago Bank. It has about $200,000 deposits, so that the South Chicago Savings will start with a good nucleus. The South Chicago Savings is the institution organized by officials of the Illinois Steel Co. E. J. Buffington, president of the Illinois Steel Co., will probably be president. Mr. Ingraham will be connected with the bank in an advisory capacity, while Warren W. Smith, cashier of the Ingraham Bank, has been selected for cashier of the new institution.

It is reported that President Hill, of the Great Northern R. R. Co., will erect a steel and iron plant in Great Falls, Montana, having purchased a half interest in the Conrad mines of Chateau County, that state. It is also said that all along the line of the Great Northern system Mr. Hill has been acquiring iron deposits, paying for one group near the Spokane and Northern line $60,000.

Chas. W. Wharton, a well known business man and philanthropist, of Philadelphia, died Aug. 16, aged 79 years. He was a large holder of Bethlehem Steel Co. stock before that corporation was absorbed.

The New York Shipbuilding Co. has purchased 80,000 tons of manufactured iron and steel from the Lancashire Iron Co., of Scotland.

Cochrane Receiver Separators

For High Pressure Engines.

BECAUSE of the greater expansive force that can be obtained from high pressure steam, much higher pressures are now carried in steam plants than formerly. By designing engines with large steam ports and valve openings, effort is made to reduce the drop in pressure, as the steam passes from the supply pipe to the engine cylinder.

It is equally important that the full boiler pressure be realized at the throttle valve, and there is no better way of compensating for the loss in pressure due to passing the steam through long lines of pipes than by placing a Cochrane Receiver Separator right next to the throttle valve, or in the horizontal run of pipe as close to the engine as convenient, thereby providing a large steam reservoir, under full boiler pressure, from which the engine can take its supply.

A long steam pipe, even though of large size, will not give the same results as a Receiver, because the flow of steam has to be stored in the pipe every time the engine takes steam through such a pipe—this means a loss.

The cost will not be very much, and the increase in engine economy amounts to no trivial quantity. Besides, these COCHRANE RECEIVER SEPARATORS will prevent accidents due to water in the steam.

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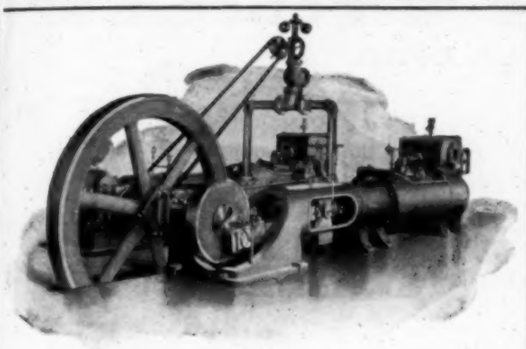
SMITH=VAILE AIR COMPRESSORS



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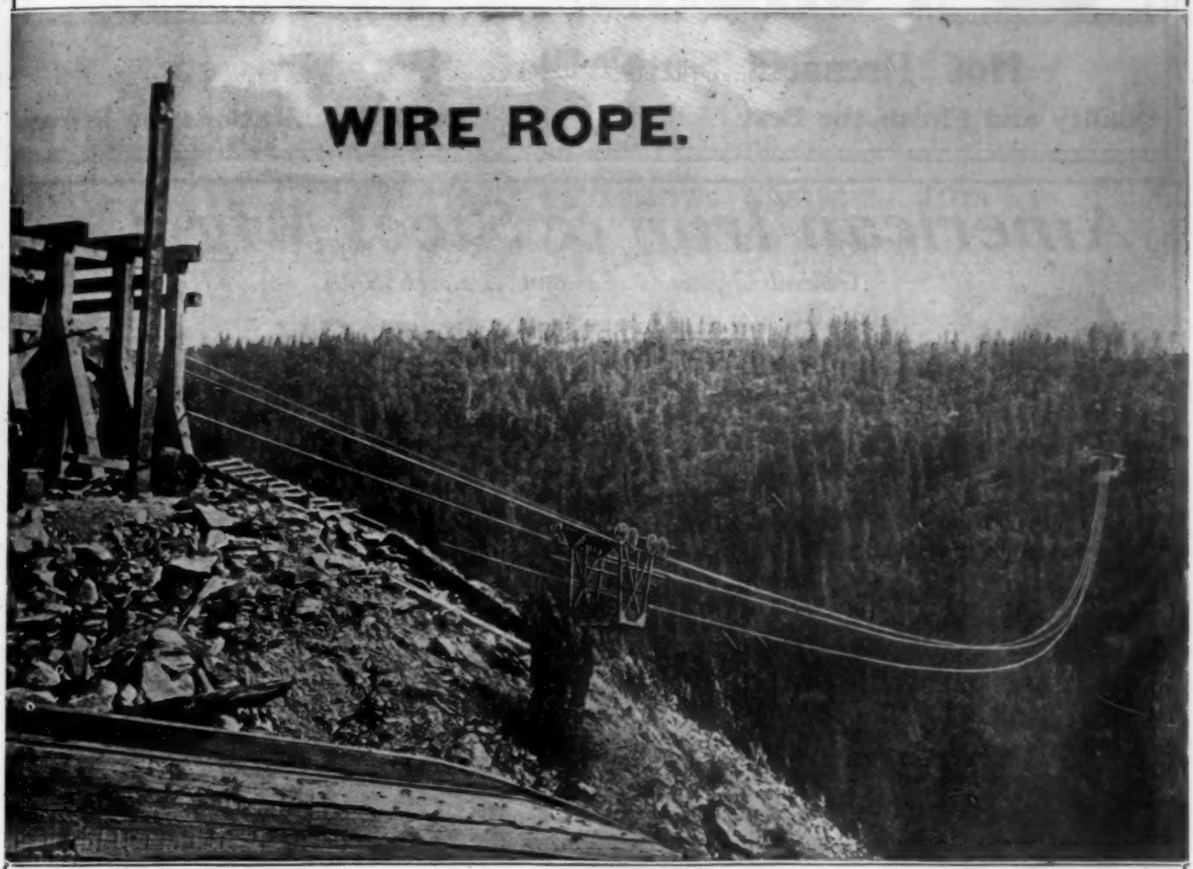

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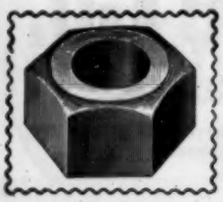

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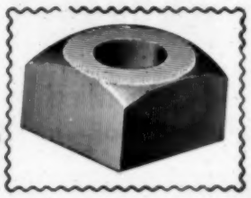

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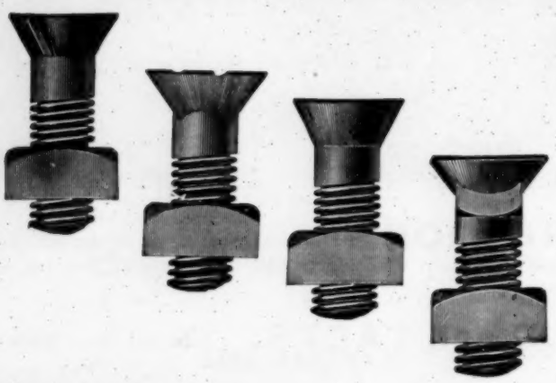

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